

BOSTON PUBLIC LIBRARY



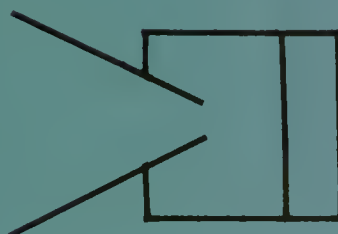
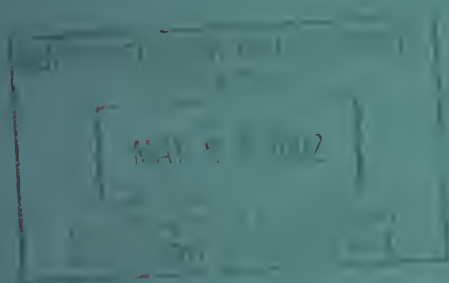
3 9999 06317 747 9

TUFTS UNIVERSITY LIBRARY
DOCUMENT COLLECTION

Doc #

LIVE-TRAPPING

NORTH AMERICAN UPLAND GAME BIRDS



UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

BUREAU OF SPORT FISHERIES AND WILDLIFE

Special Scientific Report--Wildlife No. 106

United States Department of the Interior, Stewart L. Udall, *Secretary*
Stanley A. Cain, *Assistant Secretary for Fish and Wildlife and Parks*
Fish and Wildlife Service, Clarence F. Pautzke, *Commissioner*
Bureau of Sport Fisheries and Wildlife, John S. Gottschalk, *Director*

Live-Trapping North American Upland Game Birds

By

Sanford R. Wilbur, Wildlife Biologist
Division of Wildlife Refuges
Portland, Oregon

CONTENTS

	Page
Introduction	
General considerations.	1
Methods of trapping.	2
Family Tetraonidae	
Blue grouse	3
Spruce grouse.	4
Ruffed grouse.	4
Ptarmigans	10
Prairie chickens.	10
Sharp-tailed grouse.	11
Sage grouse	15
Family Phasianidae	
Bobwhite	17
Scaled quail	19
California quail.	20
Gambel's quail	22
Mountain quail	22
Harlequin quail.	23
Ring-necked pheasant.	23
Chukar	25
Gray partridge	25
Family Meleagrididae	
Wild turkey	26
Family Rallidae	
Clapper rail.	29
Virginia and sora rails.	30
Family Scolopacidae	
Woodcock.	30
Common snipe	32
Family Columbidae	
Band-tailed pigeon.	33
White-winged dove.	34
Mourning dove	34
Index to traps	37

Live-Trapping North American Upland Game Birds

Live-trapping has become an important tool in the study and management of North American upland game birds. Uses of live-trapping include (1) transplanting birds to areas where there are no natural populations or where natural populations have been reduced or eradicated, (2) removing offending species from depredation areas, (3) obtaining brood stock for game farms, and (4) studying species behavior, movements, survival, etc. The object of this paper is to bring together materials on the various methods used to trap upland species. Emphasis has been placed on compiling a comprehensive list of pertinent literature rather than on treating each technique in detail; more extensive treatment is given data not readily available elsewhere.

In this paper, the term "upland game" covers North American gallinaceous birds of the families Tetraonidae, Phasianidae, and Meleagridae, and members of the Rallidae (except coots and gallinules), Scolopacidae, and Columbidae that are classified as game species.

GENERAL CONSIDERATIONS

Any trapping program, to be successful, must be planned to fit existing conditions. In general, the following points should be considered.

1. The method must take into account the species to be trapped, its habits, food preferences, population size, wariness, etc. Each species varies greatly in its "catchability" with different traps and different baits. Best results are usually obtained by building the trap for the birds rather than trying to mold the birds to fit the trap.

2. The terrain at the trap site is often limiting. Topography will make some methods

unfeasible, and vegetation will limit the use of others. Ease of access to the trap site and degree of trap portability must also be considered.

3. The time of year will affect the number of birds in an area, their food preferences, flocking habits, and wariness. Seasonal weather conditions affect the mechanics of some traps, making them unusable.

4. Traps differ in the number of birds they can capture at one time. If many birds are needed, a trap that takes 50 at a time will be better suited to the project than one working equally well but taking only one bird at a time.

5. The time allotted for the trapping project will determine the speed with which the birds must be caught, as well as determine the general trap construction. If the trapping period is to be short, a trap capable of taking large numbers of birds will probably be desired; under these conditions one would not usually construct a highly complex or permanent trap.

6. In a few cases, the number of workers available may be limiting. For example, some drive-trapping techniques require a large crew.

7. The funds available will limit the materials used, the number of trappers employed, the length of the operation, etc.

8. Both Federal and State regulations apply to trapping and marking game species. Special permits are required, and certain techniques may be prohibited. Anyone anticipating a trapping program should have full knowledge of the regulations involved.

METHODS OF TRAPPING

Procedures for trapping upland game birds can be conveniently placed in four categories:

1. Bait traps: The birds are enticed into a trap by food or other bait (a captive bird, water, etc.).

2. Accidental traps: The birds enter the trap accidentally in the course of their travels, as in mist-netting flying birds.

3. Drive traps: The birds are driven toward and into a trap, a method used for

sage grouse, quail, white-winged doves, and others.

4. Miscellaneous methods: The birds are caught by any of a number of methods, some suited only to particular species. Examples are spotlighting, handnetting, and immobilizing with drugs.

In this report, the four categories are considered as they apply to each game bird. Where methods are useful for more than one species, a description will appear under one heading only.

Family TETRAONIDAE

BLUE GROUSE

Dendragapus obscurus

BAIT TRAPS

The blue grouse feeds on fir needles, tender leaves, insects, fruits, and berries (Leopold, 1956) and is generally very difficult to bait-trap. Ligon (1946) states that blue grouse can sometimes be caught in traps set around or near watering places, using the water as bait. The procedure is to set long leads of chicken wire or netting that gradually taper to a narrow "V" at the trap entrance. The birds follow their usual route to water, come upon the lead, and follow it into the trap. This technique has been used in many other instances and will be referred to frequently. See figure 1 for a generalized lead trap setup.

Another "bait" trap used successfully for blue grouse cocks on territory is the mirror trap (Mussehl, 1960). In this instance, the cock is enticed into catching himself when he attempts to battle another cock (a mirror) that has invaded his territory. This method will be described further in the ruffed grouse section.

ACCIDENTAL TRAPS

Mussehl (1960) had some luck with a lead trap similar to that described above. The traps were set in a brushy area where birds travelled frequently. As this is simply a matter of putting a trap where there are birds and hoping they walk into it, this method is probably best suited to areas where there are substantial grouse populations.

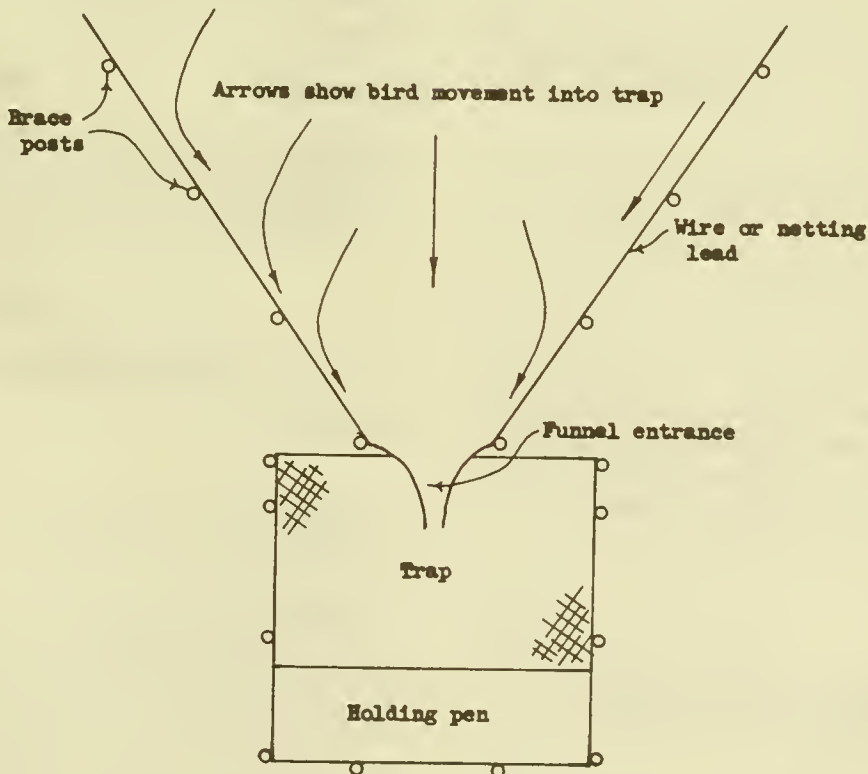


Figure 1.—Generalized lead trap: Bait, "accidental," or drive trap.

DRIVE TRAPS

Ligon (1946) states that blue grouse can be "drive-netted", probably with a lead trap (see above). Tomlinson (1963) used a lead trap to capture hens with broods, in late summer. His trap consisted of two 75-foot chicken-wire leads joined to a 20-foot funnel. The funnel was made of netting attached to aluminum wickets, with a wooden holding pen at the end. He had difficulty with the initial discovery of broods, but success was excellent after birds were located. When a brood was found, one or two observers kept the birds in sight while others set up the trap across the birds' probably escape route. When the trap was set (a 10- to 20-minute operation), all personnel joined to drive the grouse toward the trap. The birds entered the trap readily, if allowed to move slowly without excess pressure.

MISCELLANEOUS METHODS

Nooses.--Bendell (1955) reports that grouse can be captured with a sliding noose of plastic line on a 10- or 11-foot bamboo cane. The noose is dropped around an unsuspecting bird's neck, then pulled tight.

Hand nets.--In Montana, Mussehl (1960) captured broods with a hand net. He used nets ranging from 30 to 36 inches in diameter, with 9- to 10-foot handles.

Cannon-net trap.--This trap (see sharp-tailed grouse) was tried by Mussehl (1960) but was unsuccessful because of the roughness of the terrain in which he was working. It might be useful if grouse are congregated in an area of minor slope and fairly open cover.

REFERENCES

- Bendell, J. F.
1955. Age, breeding behavior and migration of sooty grouse, *Dendragapus obscurus fuliginosus* (Ridgway). North American Wildlife Conference, Transactions 20:367-381.
- Leopold, A. S.
1956. Game birds and mammals of California: a laboratory syllabus. California Book Co., Berkeley. 128 p.

Ligon, J. S.

1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.

Mussehl, T. W.

1960. Blue grouse production, movements, and populations in the Bridger Mountains, Montana. Journal of Wildlife Management 24(1):60-67.

Tomlinson, R. E.

1963. A method of drive-trapping dusky grouse. Journal of Wildlife Management 27(4):563-566.

SPRUCE GROUSE

Canichites canadensis

Ligon (1946) states that spruce grouse can be caught in daylight with long-handled nets; also, that they can be drive netted, if there is an ample population that has not been overly disturbed by hunting.

While there is little published on this species, it is probable that most blue grouse trapping methods are applicable to the spruce grouse.

REFERENCE

Ligon, J. S.

1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.

RUFFED GROUSE

Bonasa umbellus

BAIT TRAPS

Methods of bait-trapping ruffed grouse can be conveniently classified by the seasons in which they are operative.

Winter trapping.--Dorney and Mattison (1956) found it possible to bait Wisconsin ruffed grouse into their wooden bob cage (fig. 2). The trap worked best on snow-covered ground. A shelter of leafy oak boughs (3 feet square and 2 feet high) was prebaited with dogwood berries (Cornus sp.) and mountain ash berries (Sorbus sp.) until the grouse were using the area regularly. Then the bob trap

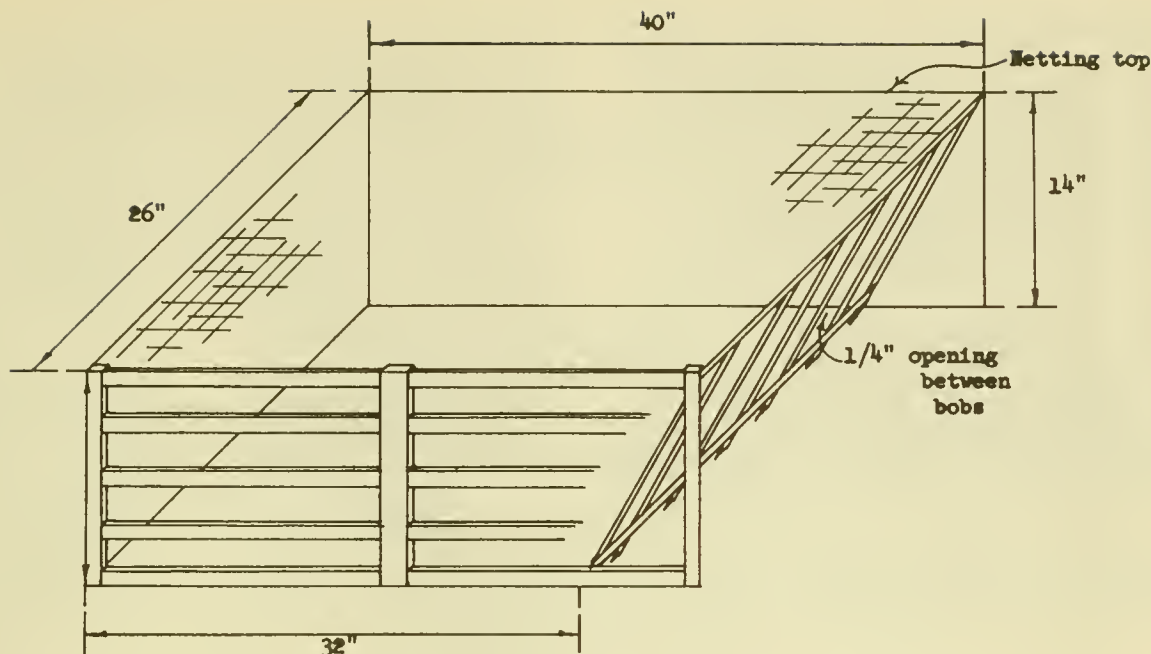


Figure 2.--Wooden bob cage (after Dorney and Mattison, 1956). Bobs are placed to open inward when pushed against; bottom stop rod prevents them from being pushed outward for escape.

was set up under the shelter, and trapping began.

Bump et al. (1947) winter-trapped ruffed grouse in a wire trap (design not described) baited with apples and grain. They found that this bait would not work after the birds had changed to a winter diet of buds.

Dr. S. W. Harris (personal communication) states that some luck has been had in Minnesota with a tip-top trap approached by wire leads (see sharp-tailed grouse).

Gullion (1965) describes a modified clover-leaf trap (see "fail trapping" below) baited with dyed corn. He found this trap to be successful from mid-August thru mid-May. When the ground was bare in fall and spring, traps established in brushy areas were successful irrespective of overhead cover. Once snow was on the ground, only traps placed under low-hanging coniferous boughs proved acceptable. When temperatures dropped below

0° F., the skin of captured grouse often froze to the metal of the trap.

Spring trapping.--During the spring months, the male ruffed grouse spends almost all his time on or near his drumming log. During this time he is particularly aggressive to other birds that come into his territory (Edminster, 1954). This behavior has been taken advantage of with the mirror trap. The "bait" in this case is the cock's own image in a mirror placed in the trap. Tanner and Bowers (1948) were among the first to use the mirror trap. They built a rectangular box of 1- by 2-inch welded wire, 28 inches long by 14 inches wide and 18 inches high. One end had a sliding door that was released by the bird when he stepped on a treadle inside the trap. The opposite end of the trap held an 8- by 10-inch mirror. The whole trap was sprayed with brown paint to blend with the surroundings.

Bendell and Fowle (1950) used essentially the same method, but substituted half-inch poultry netting for welded wire. They also

devised a mousetrap triggering mechanism which they felt was more effective than the treadle trigger. A light thread was strung inside the trap in such a way that the grouse would break it when trying to reach the mirror. The breaking thread triggered the mousetrap and released the door. The Bendell-Fowle trap is shown in figure 3.

Dorney and Mattison (1956) used a trap similar to the early models, but reduced the dimensions to 12 by 10 by 23 inches. They also replaced the wire on the sides and top with fish netting, making the trap lighter and helping reduce injuries to trapped birds.

The mirror trap was again revised by Chambers and English (1958) during their

grouse study in Pennsylvania. They kept the cloth netting used by Dorney and Mattison (1956) but reverted to the treadle door trigger used by earlier workers. Their trap was 30 by 16 by 12 inches and had hinges at the base of the trap and removable dowels for the upper braces. These modifications make the trap collapsible and much easier to handle than other models. The Chambers-English trap is shown in figure 4.

Some general recommendations for mirror-trapping have been made by Dorney and Mattison (1956):

1. A high-quality mirror should always be used, as success appears directly related to the clarity of the image.

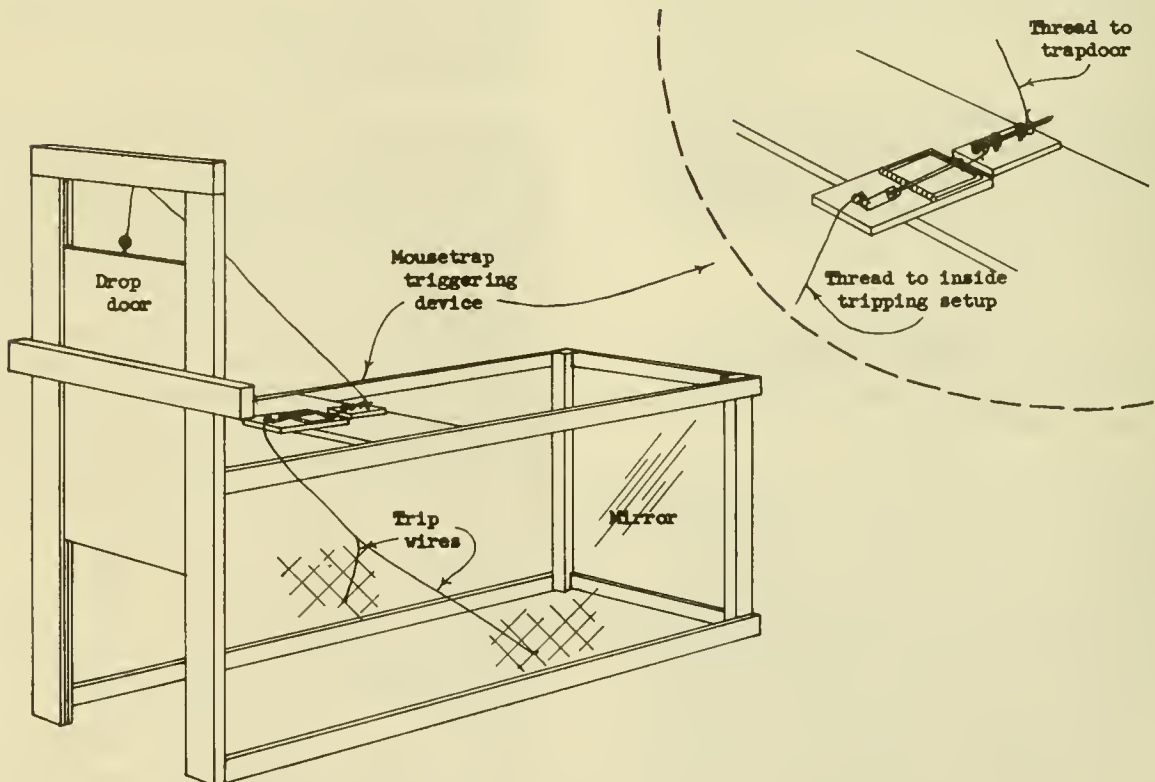


Figure 3.—Bendell-Fowle (1950) mirror trap.

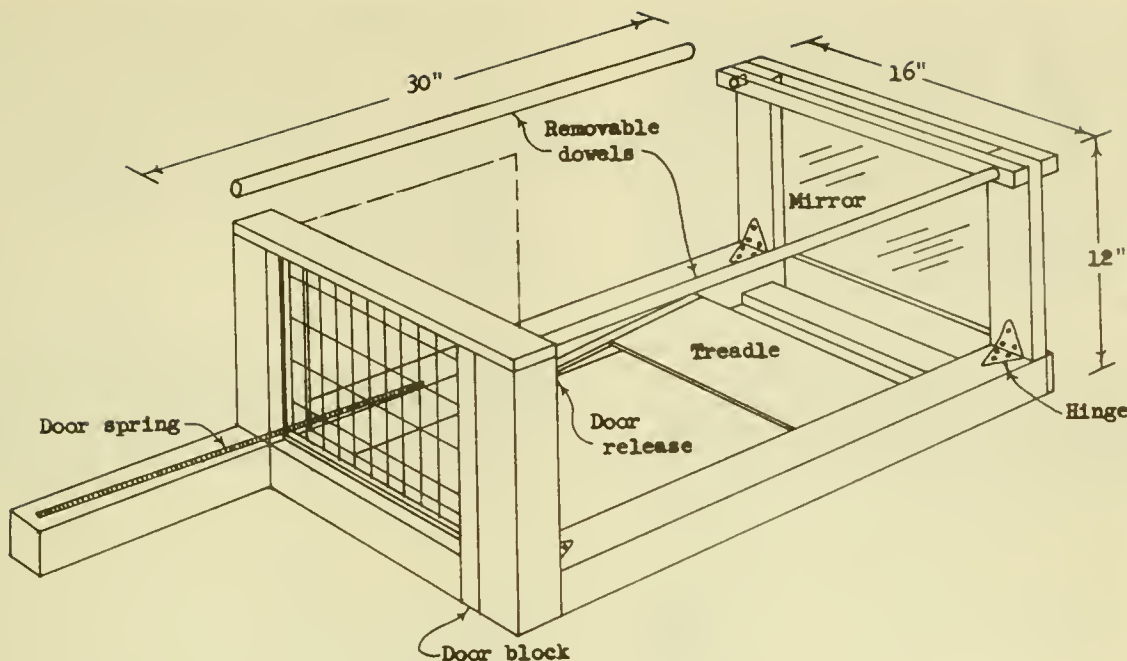


Figure 4.—Chambers-English (1958) mirror trap.

2. The trap should be set on the drumming log 3 to 6 feet from the drumming spot. Placing the trap closer usually frightens the bird. The drumming spot can be located by observing the bird or by finding large accumulations of droppings.

3. The trap should be placed at an angle that will give a good mirror image when the bird is on its drumming spot.

4. Camouflaging the trap with branches helps stop possible hawk predation, and also appears to keep the birds from shying away from the trap.

Gullion (1965) found that about 6 percent of his mirror-trapping time was wasted on unwanted catches--rabbits, chipmunks, skunks, small birds, etc. When he sprayed traps with a commercial dog repellant, he reduced the number of "unwelcome visitors" considerably without affecting grouse-trapping success.

The mirror trap can also be used when grouse are on territory in the fall. However, Gullion (1956) found that fall-trapped grouse

were very difficult to retrap the following spring.

Summer trapping.--A method for capturing hens with their broods has recently been developed by Edwards (1961). The "bait" is one or two chicks previously caught by hand or with hand nets. The trap consists of two hardware-cloth cages, the smaller 1 foot square and 6 inches high and the larger one 4 by 4 by 2 feet. The captured chicks are placed in the small cage, and this is set in an open area near where the chicks were obtained. The larger cage, which has short funnel entrances in two sides, is placed over the smaller cage, then is covered with plastic to keep the birds dry in case of showers. The crying of the chicks in the trap attracts the hen and the rest of the brood. They enter through the funnels and cannot return. The hen usually does not enter the trap until just before dark.

Fall trapping.--In Wisconsin, Dorney and Mattison (1956) found that a good time to trap ruffed grouse was in August and September when they flock together in groups brood-size or larger. Their trap was a modification of

the three-leaf-clover trap described by Lincoln and Baldwin (1929). This consists of wire or netting leads that the grouse follow to a cage that is entered through a narrow V-shaped entrance. Chambers and English (1958) modified this trap by adding cages at the end of the leads, forming a 3-trap group along each set of leads. This system increased the catch, as birds wandering either way along the leads would walk into a trap.

Gullion (1961) added a swinging wire gate to the front of each entrance when he found that some birds were escaping out the open entrances. Results were better after this addition, for birds would readily push their way

through the swinging bobs but could not push their way out again. Later, Gullion (1965) substituted a wire-netting funnel for the swinging wire gates. He considered this innovation better because grouse were less reluctant to enter it.

Figure 5 shows the various modifications of the cloverleaf trap.

Dorney and Mattison (1956) baited their traps with dogwood and mountain ash berries. Gullion (1961) obtained good results with shelled corn which had been swollen and dyed to resemble wild fruit. Among the dyes used were rhodamine B (red) and methyl violet.

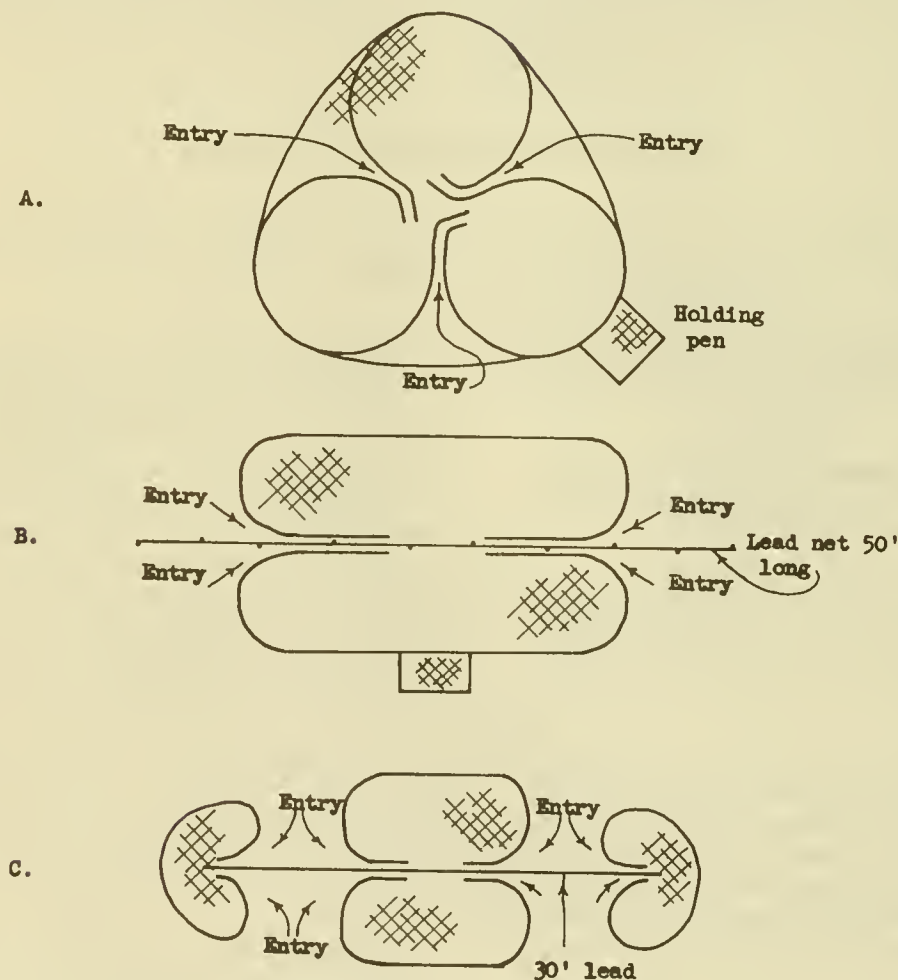


Figure 5.--Cloverleaf trap variations: a, Lincoln and Baldwin, 1929; b, Dorney and Mattison, 1956; c, Chambers and English, 1958.

These and the other dyes used appear to be nontoxic to grouse.

ACCIDENTAL TRAPS

The cloverleaf trap can be used without bait for trapping wandering broods (Liscinsky and Bailey 1955).

DRIVE TRAPS

Ligon (1946) states that ruffed grouse can be drive-netted if the population is ample and if the birds have not been made wary by hunting.

MISCELLANEOUS METHODS

Bump et al. (1947) caught female grouse on the nest by placing a hand-operated drop-door trap over the nest while the hen was away. The trap was a simple inverted "U" constructed of chicken wire, with hinged doors at each end. A string attached to the propped-open doors was pulled by the operator when the hen returned to the nest.

Bendell and Fowle (1950) suggest the following methods for capturing nesting hens:

a. A 1-inch gill net placed around the nest when the bird is away. When the bird returns, the net is pulled up and over both nest and bird with drawstrings held by an operator.

b. A throw net 2 1/2 feet in diameter dropped over a bird on its nest. Harris (1952) used a similar net for capturing female waterfowl and found it could be thrown accurately from 35 feet.

c. A spotlight and butterfly net used to capture nesting birds at night. This is essentially the spotlighting method found very successful for capturing roosting pheasants.

REFERENCES

- Bendell, J. F. S., and C. D. Fowle.
1950. Some methods for trapping and marking ruffed grouse. *Journal of Wildlife Management* 14(4): 480-482.
- Bump, G., R. W. Darrow, F. C. Edminster, and W. F. Crissey.
1947. The ruffed grouse--life history, propagation, management. New York Conservation Department, Albany. 915 p.
- Chambers, R. E., and P. F. English.
1958. Modifications of ruffed grouse traps. *Journal of Wildlife Management* 22(2):200-202.
- Dorney, R. S., and H. M. Mattison.
1956. Trapping techniques for ruffed grouse. *Journal of Wildlife Management* 20(1):47-50.
- Edminster, F. C.
1954. American game birds of field and forest. Charles Scribner's Sons, New York. 490 p.
- Edwards, M. G.
1961. New use of funnel trap for ruffed grouse broods. *Journal of Wildlife Management* 25(1):89.
- Gullion, G. W.
1961. A technique for winter trapping of ruffed grouse. *Journal of Wildlife Management* 25(4): 428-430.
- 1965. Improvements in methods for trapping and marking ruffed grouse. *Journal of Wildlife Management* 29(1):109-116.
- Harris, S. W.
1952. A throw net for capturing female waterfowl on the nest. *Journal of Wildlife Management* 16(4):515.
- Ligon, J. S.
1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.
- Lincoln, F. C., and S. P. Baldwin.
1929. Manual for bird banders. U.S. Department of Agriculture, Miscellaneous Publication 58. 116 p.
- Liscinsky, S. A., and W. J. Bailey Jr.
1955. A modified shorebird trap for capturing woodcock and grouse. *Journal of Wildlife Management* 19(3):405-408.
- Tanner, W. D., and G. L. Bowers.
1948. A method for trapping male ruffed grouse. *Journal of Wildlife Management* 12(3):330-331.

PTARMIGANS

Lagopus sp.

Ligon (1946) states that ptarmigan "may be drive-netted while ranging on ridges and south slopes before the coming of new snow in the fall". He also mentions capture with long-handled nets, which are dropped over the unsuspecting birds. Choate (1963) followed this latter method, using a net with an 8-foot handle.

REFERENCES

- Choate, T. S.
1963. Habitat and population dynamics of white-tailed ptarmigans in Montana. *Journal of Wildlife Management* 27(4):684-699.
- Ligon, J. S.
1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.

PRAIRIE CHICKENS

Tympanuchus sp.

BAIT TRAPS

Hammerstrom and Truax (1938) devised a funnel bait trap which they used successfully for trapping prairie chickens. This trap was a crate 48 by 24 by 18 inches. It was covered with chicken wire, and a funnel just large enough for a bird to enter was placed in one or both ends.

Baited tip-top traps (see sharp-tailed grouse) have been used by Jacobs (1959); he does not consider them very satisfactory. His suggestion for best trapping success is a net suspended over a baited area and released to drop over the feeding birds (Jacobs 1958, 1959). Best results were obtained when an area regularly used by chickens was prebaited for some time before the net was set up. Two-inch mesh cotton netting was used for the drop nets. Both 29- and 44-square-foot nets were found satisfactory. The net was suspended 4 feet 8 inches above the ground on steel fenceposts, the big net requiring four posts on each of two sides and the smaller net three posts. The net is released by an operator in a nearby blind. Figure 6 shows details of the triggering mechanism.

Etheredge (1943) used a 40- by 50-foot net and captured 104 lesser prairie chickens in 3 days.

All of the bait traps described were most successful during fall and winter when food was scarce or unavailable because of snow.

ACCIDENTAL TRAPS

Ligon (1946) suggests the use of lead traps (fig. 1) for capturing prairie chickens as they move along accustomed routes to feeding areas.

DRIVE TRAPS

Both Jacobs (1959) and Ligon (1946) state that prairie chickens do not drive well. However, Ligon (1946) found that it was possible to drive lesser prairie chicken broods during the late summer months when the broods were seeking the shade of brush and trees. The trap was set up in the shady area, and driving was used to supplement the birds' natural desire to head for the shade.

MISCELLANEOUS METHODS

Males have been successfully trapped with a cannon-net trap when they were concentrated on the dancing grounds (Amman, 1957). This technique is discussed under the sharp-tailed grouse section of this paper.

Spotlighting has been used by Jacobs (1959), but results were not particularly encouraging (see ring-necked pheasant).

Immobilizing drugs were used by Jacobs (1959), but success was not great and he does not recommend their use.

REFERENCES

- Amman, G. A.
1957. The prairie grouse of Michigan. Michigan Department of Conservation, Technical Bulletin 1. 200 p.
- Etheredge, O. F.
1943. Lesser prairie chicken experimental management in the Texas Panhandle. Texas Game, Fish and Oyster Commission. P-R Report, Project 1-R, Unit E. Typescript.
- Hammerstrom, F. N., Jr., and M. Truax.
1938. Traps for plumed and sharp-tailed grouse. *Bird-Banding* 9(4):177-183.

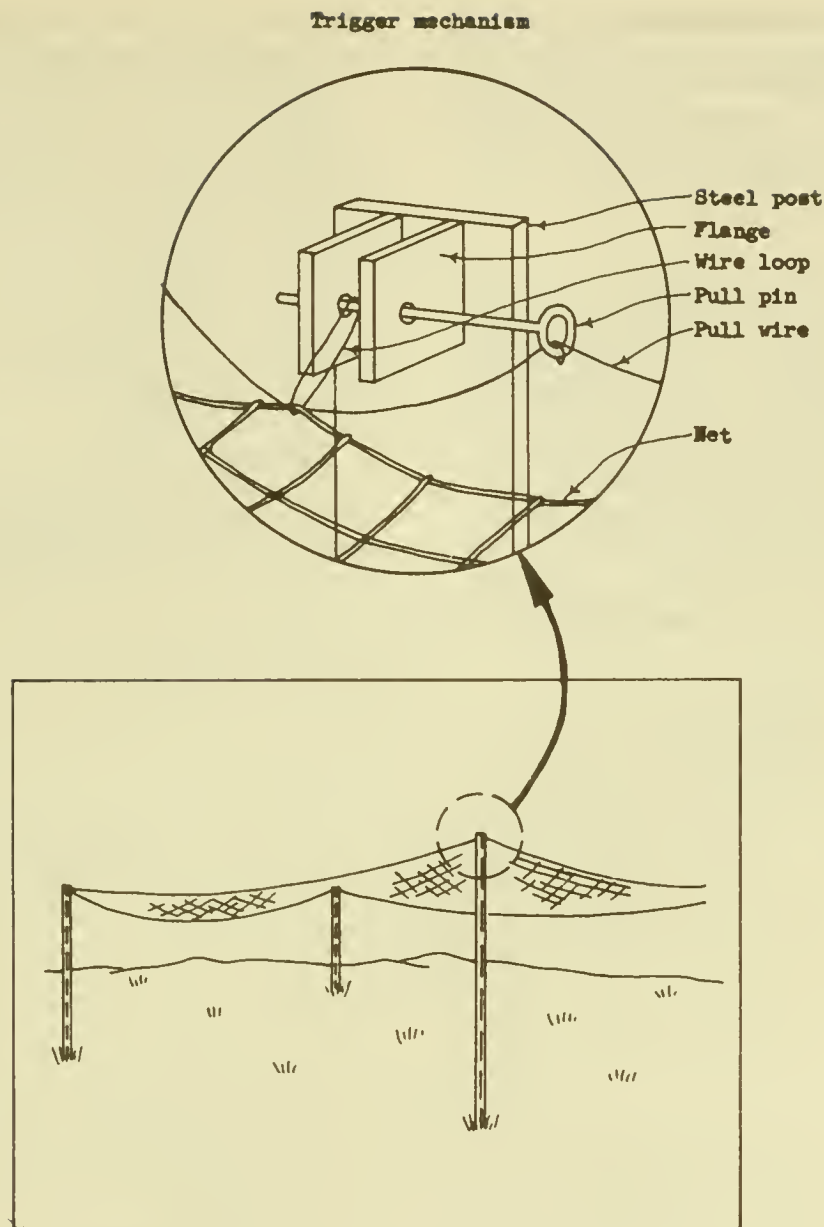


Figure 6.--Prairie chicken net trap (from Jacobs, 1959).

Jacobs, K. F.

1958. A drop-net trapping technique for greater prairie chicken. Oklahoma Academy of Science, Proceedings 38:154-157.

1959. Restoration of the greater prairie chicken. Oklahoma Department of Wildlife Conservation, Federal Aid Project W-65-R, 42 p.

Ligon, J. S.

1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe, 77 p.

SHARP-TAILED GROUSE

Pedioecetes phasianellus

BAIT TRAPS

Tip-top trap.-- This has been one of the best traps for capturing sharptails in winter. Aldous (1943) found that it worked well whenever snow covered the birds' main food supply. In Manitoba, Newman (1951) also used the tip-top successfully. Peterle (1956)

trapped-Michigan sharptails with a single-treadle type that was elevated well above the snow. Farnes (1955) used a tip-top with four treadles which he considered to have much faster action than the single-treadle type. He buried his trap so that the top was at snow level.

All tip-tops work in essentially the same way: a box is constructed that has a door in the upper surface; the door is balanced with a light spring, so that the weight of the bird will cause it to open; when the bird drops into the trap the door closes again (Mosby, 1963). Peterle (1956) used the buds and catkins of white birch (*Betula alba*) for bait. Figure 7 shows details of the single-treadle and four-treadle tip-tops.

Peterle (1956) lists the following good and bad features of his single-treadle, above-ground tip-top:

Good.--Trapped birds are protected from adverse weather and from possible predation; bait is placed above the ground and stays free of snow; drifting snow generally will not upset the simple trap mechanism.

Bad.--Periods of alternate freezing and thawing weather sometimes froze wooden door to side of trap; traps are heavy and bulky to carry around.

Bob-entrance trap.--A box trap with a bob wire entrance has been used by Newman (1951) and by Peterle (1956). The grouse pushes its way through the one-way swinging bobs in search of the bait and cannot push its

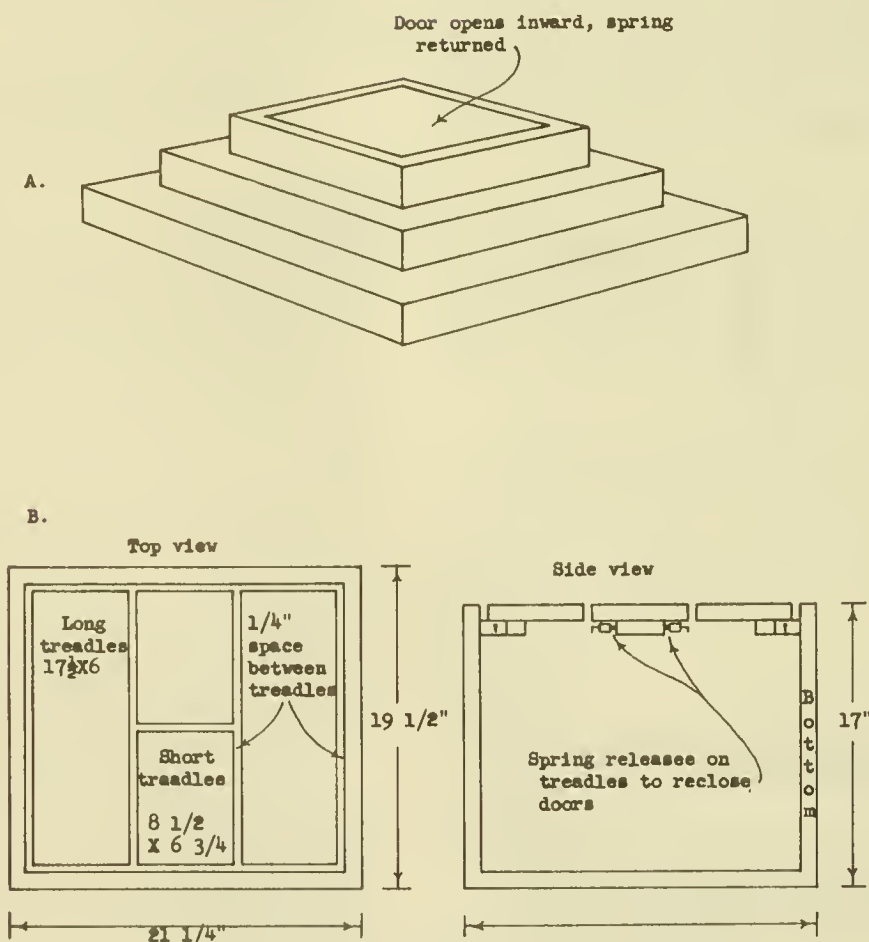


Figure 7.--Tip-top traps: a, Single-treadle, above ground (after Petrides, 1956); b, Four-treadle, underground (Farnes, 1955)

way out again. Peterle (1956) does not recommend this type of trap in snow country because it becomes clogged with snow easily. It also leaves the birds exposed to weather

and predation. When Newman (1951) used this type of trap he found that fewer grouse escaped when he added a second bob entrance inside the first.

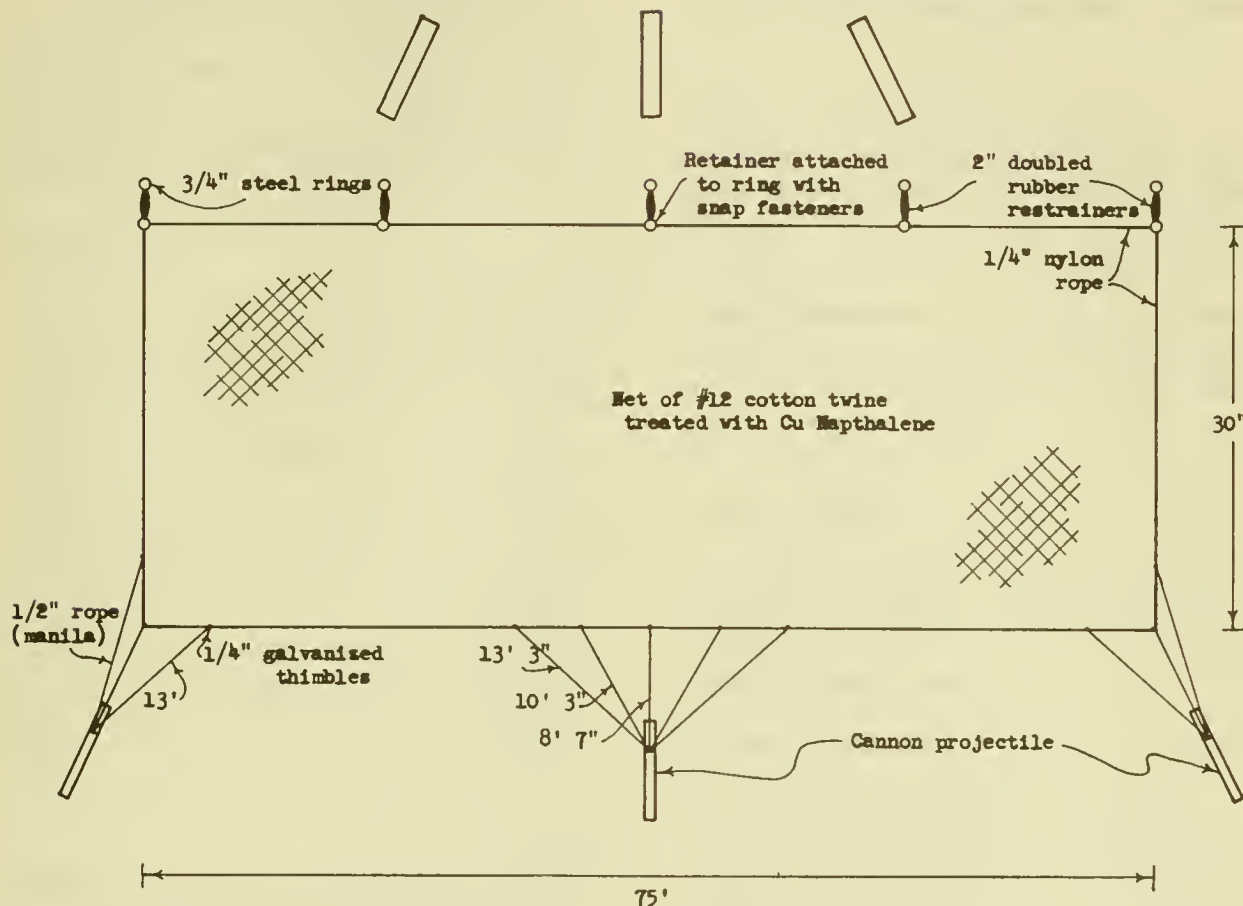


Figure 8.--Dill cannon-net assembly (from Fish and Wildlife Service, 1955)

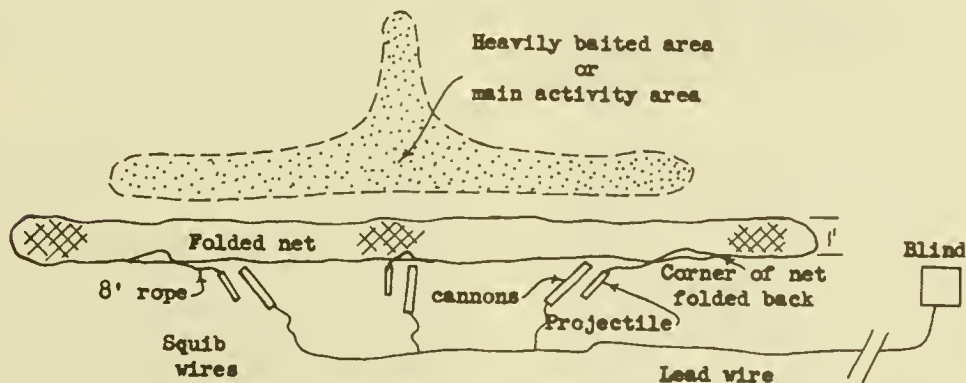


Figure 9.--Diagram of cannon-net trap operation (from Steenis, in Addy, 1956). Similar arrangements have been used on sharptail dancing grounds, at mineral seeps for pigeons, and baited with corn or other grain for pheasants and others.

Funnel-entrance traps.--Traps with small funnel entrances have been used by Klett (1957) and by Peterle (1956). While this type of trap may be useful in some circumstances, Peterle (1956) does not recommend it for snow country. Drifting snow quickly clogs the funnels and the birds cannot use the traps.

ACCIDENTAL TRAPS

Ligon (1946) states that lead nets can sometimes be placed so that grouse will follow them into a trap while on their way to feeding grounds.

DRIVE TRAPS

Ligon (1946) states that sharptails do not drive well and that this method is not generally useful.

MISCELLANEOUS METHODS

Cannon-net trap.--While originally developed as a waterfowl trapping technique, the cannon-net trap is useful for any species which habitually flocks together (Dill and Thornsberry, 1950). It has been used for sharptails in Michigan (Peterle, 1956) and in South Dakota (U.S. Fish and Wildlife Service, 1955). Grouse trapping has so far been limited to the dancing grounds in the spring.

The cannon-net trap consists of a large, light net which is carried over the concentrated birds by mortar projectiles (Mosby, 1963). The nets, of cotton or nylon, vary in size from 25 by 75 feet (Addy, 1956) to 100 by 60 feet (Peterle, 1956). One projectile is usually required for each 50 feet of net (Mosby, 1963). A net assembly used by Dill (U.S. Fish and Wildlife Service, 1955) is shown in figure 8, while figure 9 depicts a typical trapping setup.

The net propellant originally used by Dill and Thornsberry (1950) was a mixture of potassium chlorate and cane sugar. This was effective and relatively quiet but is unstable and sometimes hazardous to use. Some workers still prefer this mixture, but Kirsch (in Addy, 1956) recommends a black powder charge.

Many modifications of the cannon-net trap have been developed since Dill and Thornsberry (1950) built their first trap. Plans of

various designs and details of their use may be found in Black and Evans (1953), U.S. Fish and Wildlife Service (1955), and Addy (1956). Recently Thornsberry (1963) developed a new cannon which many feel is far superior to other designs. This new cannon features (1) an inverted barrel to eliminate condensation, (2) a neoprene ring to form a tight seal between barrel and projectile (thus alleviating the need for precise machining), and (3) 12-gauge black-powder cartridges used as the charge. The new cannon is also considerably cheaper to construct than others, \$25 compared with \$45 for the next cheapest model.

REFERENCES

- Addy, C. E. (compiler)
1956. Guide to waterfowl banding. U.S. Fish and Wildlife Service, Laurel, Md. 164 p.
- Aldous, S. E.
1943. Sharp-tailed grouse in the sand dune country of north-central North Dakota. *Journal of Wildlife Management* 7(1):23-31.
- Black, K. E., and C. D. Evans.
1953. A modification of the cannon-projected net banding trap. U.S. Fish and Wildlife Service, Minneapolis, Minn. 9 p.
- Dill, H. H., and W. H. Thornsberry.
1950. A cannon-projected net trap for capturing waterfowl. *Journal of Wildlife Management* 14(2):132-137.
- Farnes, R. E.
1955. A new tip-top trap for taking prairie grouse. *Flicker* 27(3):123-125.
- Klett, A. T.
1957. Banding and marking methods in studying seasonal movements of the sharp-tailed grouse in Morton County, North Dakota. M.S. thesis, Utah State Agricultural College. 53 p.
- Ligon, J. S.
1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.
- Mosby, H. S. (editor)
1963. *Wildlife investigational techniques*, 2d edition. Wildlife Society, Ann Arbor, Mich. 300 p.
- Newman, W. L.
1951. Notes on trapping sharp-tailed grouse in Manitoba. *Journal of Wildlife Management* 15(2): 223-224.
- Peterle, T. J.
1956. Trapping techniques and banding returns for Michigan sharp-tailed grouse. *Journal of Wildlife Management* 20(1):50-55.
- Thornsberry, W. H.
1963. A composite cannon for net traps. Swan Lake Refuge, U.S. Fish and Wildlife Service. 4 p.

SAGE GROUSE

Centrocercus urophasianus

Ligon (1946) called the sage grouse the "most temperamental and unpredictable of all our upland game birds." Despite this description, several very efficient methods have been worked out for trapping this species.

BAIT TRAPS

Small-sized funnel traps have been used for sage grouse trapping, but the Wyoming Game and Fish Commission does not advocate their use. Their report (1961) indicates that these traps are too small and too low to hold many birds and that they frighten the birds more than other methods.

Patterson et al. (1950) used a large-sized, winged bait trap measuring 28 by 14 feet by 42 inches high. The frame was made of steel fenceposts (6 needed) to which roof supports of iron pipe were attached. This frame was then covered with 2-inch cotton netting. An entrance "V" was made which narrowed to a 10-inch width about 6 feet inside the front arch.

Best results were obtained with this trap during the late summer when the young are almost grown and flocks are beginning to form. Traps were set after the grouse completed their morning feeding, and were ready for use when they returned to feed in the afternoon.

ACCIDENTAL TRAPS

Patterson (1952) used the trap described above to capture cocks as they moved off the strutting grounds. The trap was placed across the route usually followed by departing birds. They encountered the wire leads and followed them into the trap. This same technique was tried with birds approaching the strutting ground, but it was found to be unsatisfactory. The grouse were too wary to enter the trap in most cases, and the few that did enter fought so hard to get to their strutting ground that the practice was abandoned.

DRIVE TRAPS

Several workers (Batterson and Morse, 1948; Allred, 1946; Patterson et al., 1950; Ligon, 1946) have used drive traps for capturing sage grouse. A setup similar to the Patterson bait trap is generally used, but with two chambers put together with an outer and inner entrance. This 2-chamber trap cuts escape loss considerably.

Slow-moving vehicles herd the birds between the wire leads and into the trap. Allred (1946) found that the flock would stay on the ground and drive easily before vehicles, but that the whole flock often flushed when approached on foot.

Batterson and Morse (1948) found that juvenile grouse were easiest to drive-trap. Adult hens were caught frequently, but adult cocks were very difficult to drive.

MISCELLANEOUS METHODS

Nest trap.--Patterson (1952) trapped nesting females with a large cotton mesh net. The net was thrown over the nest site, surrounding brush and all.

Cannon-net trap.--Dalke et al. (1963) used this type of trap on strutting grounds in eastern Idaho. It was found that continuous use made some males (especially subadults) wary of the strutting ground area. John and Dorothy Lacher (1964) mounted a cannon-net on the front of a jeep and caught a few sage grouse. They feel this method would be useful for capturing a small number of birds in a limited amount of time. The cannon net is covered in more detail under the discussion of sharp-tailed grouse trapping.

Clap net.--Christensen (1962) describes a clap net used for capturing Indian sand grouse. He feels this trap has potential for several North American game species, including the sage grouse. Figure 10 shows details of the trap.

The clap net is set at a location known to be used by the desired species. It is camouflaged, then pulled up and over the birds when they congregated at the trap site. Notable features

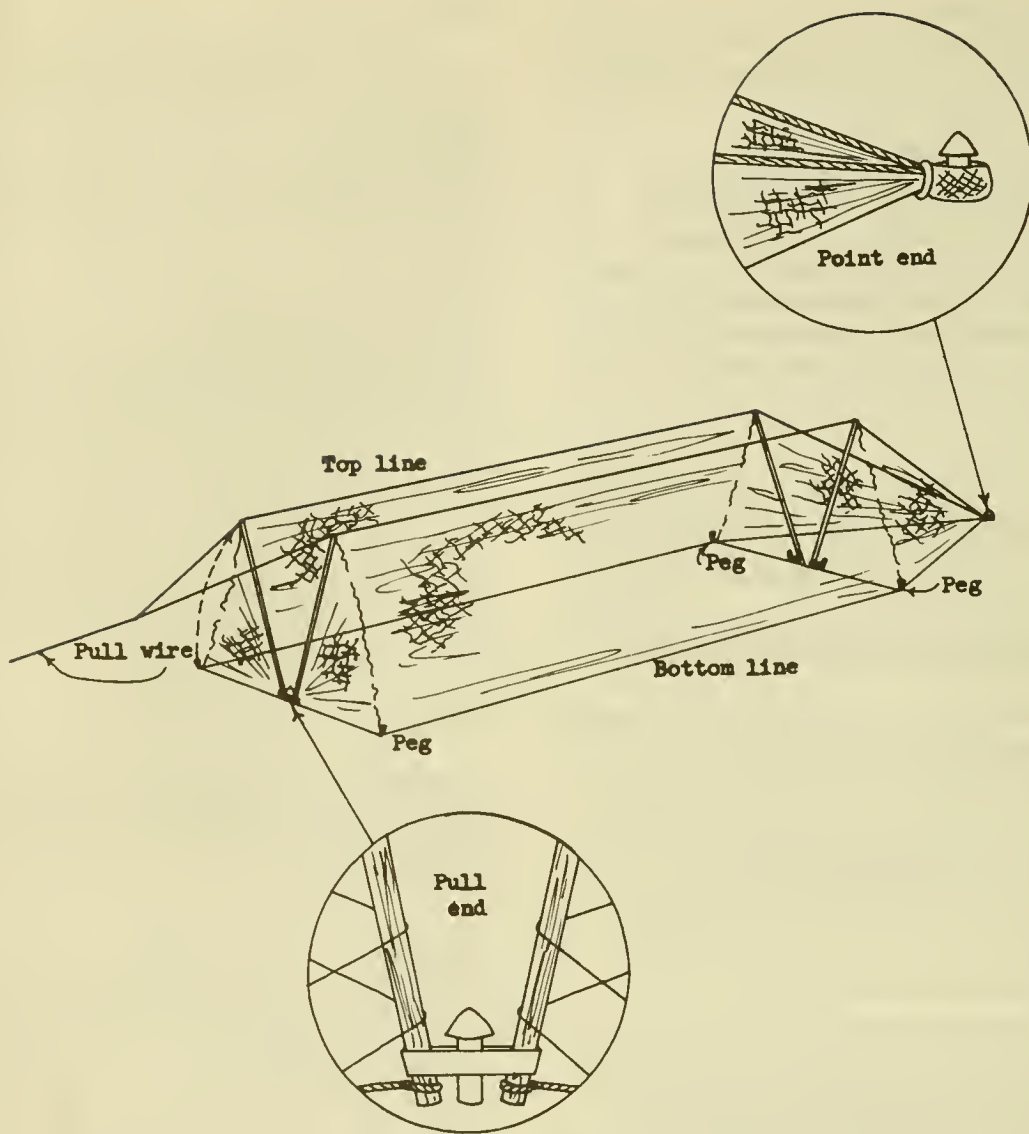


Figure 10.--Clap net (from Christensen, 1962). In firing position, the net is flat on ground; when birds enter the trap, a pull wire (operated from a nearby blind) brings the two sides up and over the birds.

of the trap are (1) instant action, (2) complete concealment, (3) usefulness both on land and over shallow water, (4) swiftness of resetting, and (5) lightness and portability.

Spotlighting.--The Wyoming Game and Fish Commission (1961) reports a variation of the standard pheasant catching technique. A two-man team, consisting of a driver and a netter, is required. The netter locates a roosting grouse with a spotlight mounted in the back of a truck. The driver finds the bird with a second spotlight. The netter turns his light off, sneaks up behind the birds and captures it with a long-handled net.

REFERENCES

- Allred, W.
1946. Sage grouse trapping and transplanting. Western Association of State Game and Fish Commissioners, Proceedings 26:143-146.
- Batterson, W. M., and W. B. Morse.
1948. Oregon sage grouse. Oregon State Game Commission, Oregon Fauna Series, No. 1. 29 p.
- Christensen, G. C.
1962. Use of the clap net for capturing Indian sand grouse. *Journal of Wildlife Management* 26(4): 399-402.

Dalke, P. D., D. B. Pyrah, D. C. Stanton, J. E. Crawford, and E. F. Schlatter.

1963. Ecology, productivity and management of the sage grouse in Idaho. *Journal of Wildlife Management* 27(4):811-841.

Lacher, J. R., and Dorothy D.

1964. A mobile cannon net trap. *Journal of Wildlife Management* 28(3):595-597.

Ligon, J. S.

1946. Upland game bird restoration through trapping and transplanting. *New Mexico Game and Fish Commission, Santa Fe.* 77 p.

Patterson, R. L.

1952. The sage grouse in Wyoming. Wyoming Game and Fish Commission. Sage Books Inc., Denver. 341 p.

-----E. F. Putnam, and H. B. Sanderson.

1950. Trapping sage grouse in Wyoming. *Wyoming Wildlife* 14(3):4-13.

Wyoming Game and Fish Commission.

1961. Game bird survey completion reports. Wyoming Federal Aid Project W-50-R-10. 300 p.

Family PHASIANIDAE

BOBWHITE

Colinus virginianus

BAIT TRAPS

The Standard (or Stoddard) quail trap (Stoddard, 1931) has provided the basic design for most of the bait traps used for the bobwhite and other species of North American quail. The original trap was a simple screen box with a funnel entrance. Quail were enticed into the cage with grain or weed seeds and, once inside, had difficulty finding their way out.

Various modification of this basic trap have since been used. Reeves (1952) reduced the size from Stoddard's original 36 by 36 inches to 30 by 36 inches, thus lessening the cost and affording easier handling. Half-inch mesh was substituted for the 1-inch mesh of the original, resulting in less injury to trapped birds and a longer life for the traps. A third modification was the substitution of a large, semiconical entrance for the original small tunnellike entry. This seemed to make the trap less frightening to the quail, and they entered more readily. Best results were obtained with a funnel 15 inches wide and 9 inches high, extending into the trap 1 foot and narrowing to an opening 3 by 4 inches.

Gooden (1953) used the Standard quail trap of hardware cloth, but modified the dimensions to 30 by 30 by 10 inches. He also made the sides in two pieces so that the trap could be collapsed for easier handling.

Schultz (1950) found the hardware-cloth trap too cumbersome and expensive, so he

devised a similar trap made entirely of 1-inch poultry netting laced together with copper wire. The trap was 2 by 2 by 1 feet. A 2-foot square piece was used for the top, and an 8 by 1-foot piece bent to make all four sides. A funnel was inserted in one end. Advantages of this trap are easy construction, low cost, collapsibility, and portability.

Kabat and Thompson (1963) found that Wisconsin bobwhite entered Stoddard traps readily. They used corn and other grains for bait, and conducted all their trapping while snow was on the ground.

Murphy and Baskett (1952) captured bobwhite in the "Government sparrow trap" (Lincoln and Baldwin, 1929). This consists of a wire bait trap with a double funnel system. A half-funnel admits the bird to an antechamber where a complete funnel opens into a second chamber. The bird goes in through the second funnel, drops to the floor of the inner chamber and cannot retreat. Guard wires projecting from the funnel outlet helps discourage attempts to hop back out through the funnel.

Two methods have been listed by Petrides (1946) as "unverified by author." The first utilizes shallow ditches which are no wider than a quail and which have a dead end. Quail reportedly follow bait into the ditch, then refuse to fly or back out. The second "unverified" technique entails threading grains of corn on lengths of horsehair. Quail and other birds reportedly refuse to fly after eating this bait.

The cock-and-hen trap is a much-used design for the capture of breeding males. Murphy and Baskett (1952) had good luck with it all year long in Missouri. The trap has an inner chamber that houses a live quail, the "bait" to attract other quail. Birds enter an outer chamber through a funnel (Genelly, 1955), a bob entrance, or a self-triggering drop - door (Reeves, 1952). Once inside, they can neither reach the "bait" nor leave the trap. The Reeves (1952) trap is shown in figure 11.

ACCIDENTAL TRAPS

None reported.

DRIVE TRAPS

Ligon (1946) states that bobwhite are readily taken with drive trap if birds are numerous

and not too wild or wary. Stoddard (1931) found that drive-trapping worked well in the more open agricultural areas but was almost impossible in brushy areas where the birds were hard to find and even harder to move to a trap. Murphy and Baskett (1952) found drive-trapping unsatisfactory on their Missouri area because of rough terrain and dense cover. In contrast, Lehmann (1946) believed that drive-trapping was the only suitable method of capture in the open Texas country he studied.

Stoddard (1931) used huge, hand-held clap-nets to catch bobwhites flushed by dogs. Some success was obtained, but these nets are heavy, awkward, hard to operate, and not generally recommended. Details are found in Lincoln (1947).

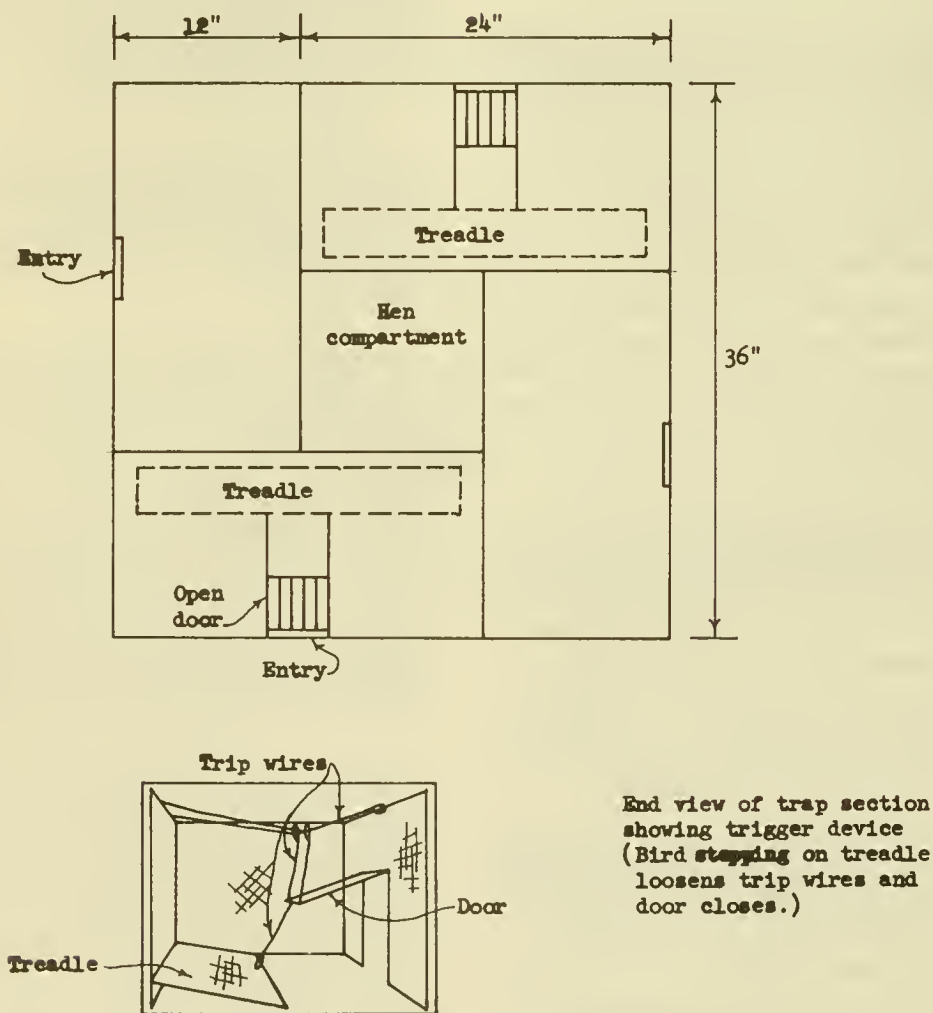


Figure 11.--Reeve's (1952) cock-and-hen trap.

MISCELLANEOUS METHODS

Ligon (1946) states that bobwhite have been spotlighted and caught in nets while roosting on the ground at night.

REFERENCES

- Genelly, R. E.
1955. Annual cycle in a population of California quail. *Condor* 57(5):263-285.
- Gooden, S. K.
1953. A collapsible quail trap. *Journal of Wildlife Management* 17(3):389-391.
- Kabat, C., and D. R. Thompson.
1963. Wisconsin quail 1834-1962: population dynamics and habitat management. Wisconsin Conservation Department, Technical Bulletin 30. 136 p.
- Lehmann, V. W.
1946. Mobility of bobwhite quail in southwestern Texas. *Journal of Wildlife Management* 10(2):124-136.
- Ligon, J. S.
1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.
- Lincoln, F. C.
1947. Manual for bird banders. U.S. Fish and Wildlife Service. 116 p.
- and S. P. Baldwin.
1929. Manual for bird banders. U.S. Department of Agriculture, Miscellaneous Publication 58. 116 p.
- Murphy, D. A., and T. S. Baskett.
1952. Bobwhite mobility in central Missouri. *Journal of Wildlife Management* 16(4):498-510.
- Petrides, G. A.
1946. Snares and deadfalls. *Journal of Wildlife Management* 10(3):234-238.
- Reeves, M. C.
1952. Mechanical aids useful in studying bobwhite quail. *Journal of Wildlife Management* 16(3):316-319.
- Schultz, V.
1950. A modified Stoddard quail trap. *Journal of Wildlife Management* 14(2):243.
- Stoddard, H. L.
1931. The bobwhite quail, its habits, preservation, and increase. Charles Scribner's Sons, New York. 559 p.

SCALED QUAIL

Callipepla squamata

BAIT TRAPS

Schemnitz (1961) successfully trapped Oklahoma scaled quail in Stoddard traps (see bobwhite) and in ladder traps.

Sowls and Greenwalt (1956) conducted an experiment in Arizona comparing the effectiveness of Stoddard traps and larger funnel traps. The larger traps were of two sizes 3 by 3 by 6 feet and 3 by 8 by 12 feet, and were constructed of chicken wire stretched over iron frames. They found that (a) the smaller, Stoddard traps averaged only 4.7 birds per catch while the larger traps averaged 9, and the smaller traps had a capacity of about 20 birds while the larger could hold more than 40; (b) the larger traps seemed to cut down the amount of "scalping" and other injuries; but (c) the larger traps were less portable than the Stoddard design, bulkier to store, and more expensive to construct.

ACCIDENTAL TRAPS

None reported.

DRIVE TRAPS

Schemnitz (1961) had best success when he drove the quail into lead traps (fig. 1) located near resting and dusting areas. Fence rows, junk piles, farm implement storage areas, and shelterbelts were other successful drive-trapping sites. He found that birds could not be forced to run very far or they would scatter and flush before entering the trap.

MISCELLANEOUS METHODS

Ligon (1946) states that it should be possible to spotlight scaled quail, as they tend to roost on the ground in fairly open areas. No references to use of this method were found.

Christensen's (1962) clap net could possibly be adapted to this species (see sage grouse).

REFERENCES

Christensen, G. C.

1962. Use of the clap net for capturing Indian sand grouse. *Journal of Wildlife Management* 26(4): 399-402.

Ligon, J. S.

1946. Upland game bird restoration through trapping and transplanting. *New Mexico Game and Fish Commission, Santa Fe*. 77 p.

Schemnitz, S. D.

1961. The ecology of the scaled quail in the Oklahoma panhandle. *Wildlife Society, Wildlife Monographs*, No. 8. 47 p.

Sowls, L. K., and L. A. Greenwalt.

1956. Large traps for catching quail. *Journal of Wildlife Management* 20(2):215-216.

CALIFORNIA QUAIL

Lophortyx californica

BAIT TRAPS

Primarily through work of the California Department of Fish and Game, a variety of bait trap techniques have been developed for this species.

Stoddard trap (see bobwhite).--Used by Genelly (1955), but seemed to be avoided by California quail.

Government sparrow trap (see bobwhite).--Used by Enderlin (1946), but found not very satisfactory.

Cloverleaf trap (see ruffed grouse).--Mentioned as having been used by Enderlin (1946).

California Department of Fish and Game collapsible steel trap (Tarshis, 1956; Enderlin, 1946).--This simple box-type funnel trap has been used with great success in open field and waterhole locations. It is lightweight and easy to transport and handle, but will hold only a small number of birds. Figure 12 shows trap construction.

Large wood-framed quail trap.--This is similar to the steel trap but is bigger and can accommodate more birds. Tarshis (1956) reports as many as 120 quail caught at one time. It has been used profitably over waterholes and in open fields but is too bulky to carry around and thus is feasible only for long-term or close-to-the-road projects. An

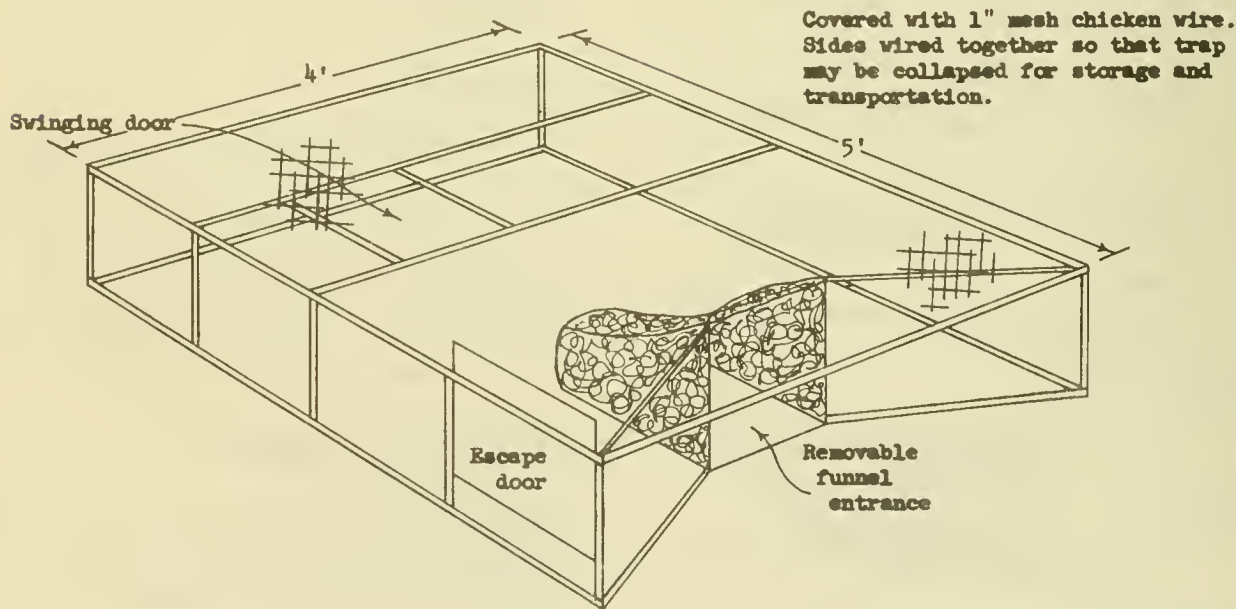


Figure 12.--Collapsible steel quail trap (after Tarshis, 1956). The trap is covered with 1-inch-mesh chicken wire, with sides wired together so that the trap can be collapsed for storage and transportation.

Innovation of this trap is a large curved throat rather than the usual small funnel. This entrance is more readily entered by quail, but is also readily found on exit so the trap must be watched closely. Figure 13 shows details of this trap.

Canoe quail trap.--Used by Enderlin (1946) and Tarshis (1956), this chicken-wire funnel trap works well over "gallinaceous guzzlers" and in irregular terrain where a flat-bottomed trap would not be usable. It consists of a piece of chicken wire folded into an open-bottomed bag, supported by several stakes and equipped with several chicken-wire funnels. The trap is simple and inexpensive to construct, easy to transport, and very inconspicuous, but is also very light and easily damaged by livestock (Tarshis 1956).

Cock-and-hen trap.--Used successfully by Enderlin (1946) and Genelly (1955). See bob-white section.

ACCIDENTAL TRAPS

None reported.

DRIVE TRAP

True (1934) obtained quail for Baja California by driving the birds into long, brush-covered wire tunnels. Enderlin (1946) states that this method is used quite a bit in Mexico but is not popular in California.

Ligon (1946) states that California quail enter nets when not hunted, but are extremely difficult to drive if frequently upset.

MISCELLANEOUS METHODS

Christensen's (1962) clap net may be usable with this species (see sage grouse).

REFERENCES

- Christensen, G. C.
1962. Use of the clap net for capturing indian sand grouse. *Journal of Wildlife Management* 26(4):399-402.
- Enderlin, R. W.
1946. Quail trapping techniques. *Western Association of Fish and Game Commissioners, Proceedings* 26:138-142.
- Genelly, R. E.
1955. Annual cycle in a population of California quail. *Condor* 57(5):263-285.

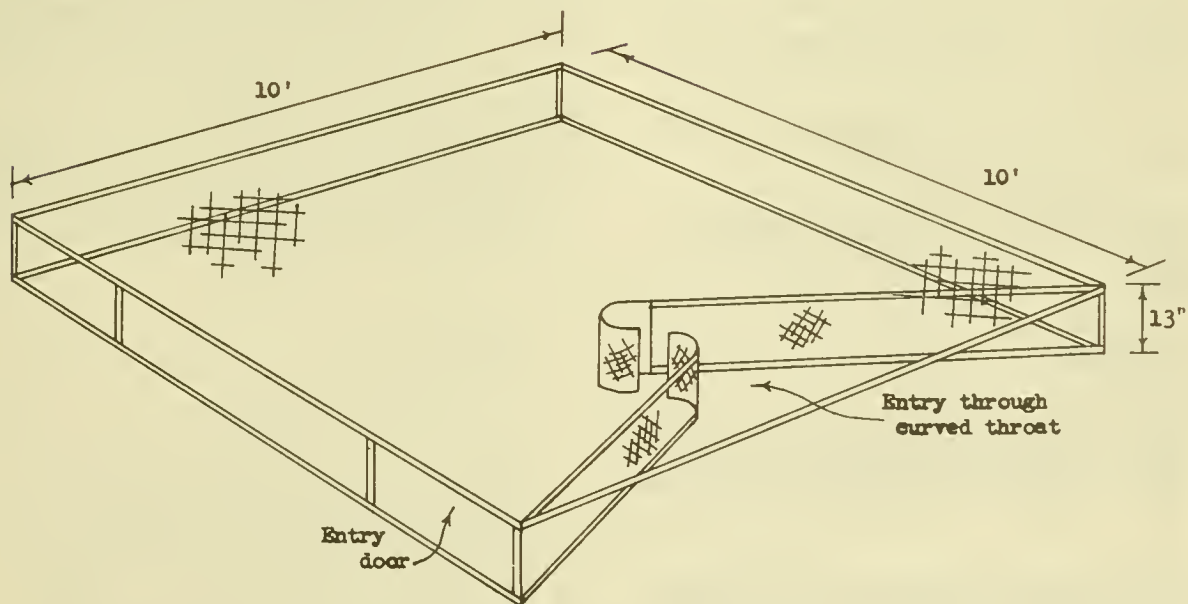


Figure 13.--Wood-frame quail trap (after Tarshis, 1956).

- Ligon, J. S.
1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.
- Tarshis, I. B.
1956. Traps and techniques for trapping California quail. *Bird-Banding* 27(1):1-9.
- True, G. H. Jr.
1934. An experiment in quail importation. *California Fish and Game* 20(4):365-370.

GAMBEL'S QUAIL

Lophortyx gambelii

BAIT TRAPS

Enderlin (1946) mentions the following as usable with Gambel's quail: government sparrow trap, collapsible steel trap, canoe quail trap, cloverleaf trap, and cock-and-hen trap. Sowls (1960) used large funnel traps for winter trapping in Arizona. Milo maize was a good bait, as was scratch feed.

ACCIDENTAL TRAPS

Non reported.

DRIVE TRAPS

Ligon (1946) states that this species has been taken by driving into a winged lead trap (figure 1).

MISCELLANEOUS METHODS

Christensen's (1962) clap net could possibly be adapted to this species (see sage grouse).

REFERENCES

- Christensen, G. C.
1962. Use of the clap net for capturing Indian sand grouse. *Journal Wildlife Management* 26(4):399-402.
- Enderlin, R. W.
1946. Quail trapping techniques. *Western Association of Fish and Game Commissioners, Proceedings* 26:138-142.

- Ligon, J. S.
1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.
- Sowls, L. K.
1960. Results of a banding study of Gambel's quail in southern Arizona. *Journal of Wildlife Management* 24(2):185-190.

MOUNTAIN QUAIL

Oreortyx picta

BAIT TRAPS

Enderlin (1946) states that the Stoddard quail trap (see bobwhite) is unusable with this species because the birds refuse to calm down after capture and continue to beat against the wire until they kill themselves. When the trap is modified by lining it with fish netting, injuries are reduced. This lining also makes the trap darker, thereby helping to calm the birds. Trapping is most successful during the summer months, using water as bait.

ACCIDENTAL TRAPS

Enderlin (1946) describes lead traps (fig. 1) set across the usual migration routes of mountain quail. Netting is strung across travel routes so that migrating birds will be funneled into a central wire trap. It is sometimes necessary to net a whole canyon in order to stop the birds. Even then, the quail are so unpredictable they may walk into the trap or fly over the first lead wire they encounter. Traps have been set for up to a week without results, then again may capture birds the first day.

DRIVE TRAPS

None reported.

MISCELLANEOUS METHODS

Enderlin (1946) describes one combination bait-drive trap operated "successfully by a person just on the outer fringes of the law." He dug a trough 5 feet long, 8 inches wide, and 8 inches deep, then covered it with brush. He flared the mouth of the trough to form

somewhat of a funnel and placed a collecting bag at the far end. When quail began to use his grain bait, the trapper would release his dog. The quail ran for the brush, went down the trough, and soon found themselves in the collecting bag!

REFERENCE

Enderlin, R. W.

1946. Quail trapping techniques. Western Association of fish and Game Commissioners, Proceedings 26:138-142.

HARLEQUIN QUAIL

Cyrtonyx montezumae

Ligon (1946) states that these quail can be drive-trapped if ample time is taken and if they are not pushed excessively. They flush easily if pressed. Ligon also mentions spotlighting as a possible technique.

REFERENCE

Ligon, J. S.

1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.

RING-NECKED PHEASANT

Phasianus colchicus

BAIT TRAPS

Ligon (1946) states that bait trapping is only possible when food is scarce or difficult to procure. This usually limits operations to the winter months; however, summer trapping has been successful in California, using water and shade as bait (Allen 1956).

One bait trap used occasionally (Leopold et al., 1938; Leopold et al., 1943) is the prairie chicken trap of Hammerstrom and Truax (1938). Corn is the preferred bait. Hicks and Leedy (1939) caught pheasants in a cloverleaf trap (fig. 5) placed at the margin of woody cover in an area devoid of natural food. Kutz (1945) modified the cloverleaf by replacing the chicken-wire sides with welded wire and covering the top with fish netting. This reduced scalping and other bird injuries associated

with the rough chicken wire. He also added a "predator skirt" to his trap, a sloping outside wall of chicken wire. This baffle prevented predators from getting at trapped birds that stuck their heads through the inside wire.

Thompson (1946) has converted permanent log lean-to feeding stations by equipping them with wire doors and funnel entrances. This type of trap was found to work well during heavy winter snows.

Leopold et al. (1938) state that most bait traps are selective for hens and juvenile birds, the cocks being less prone to enter a confining space.

ACCIDENTAL TRAPS

None reported.

DRIVE TRAPS

Buss (1946) has driven juvenile pheasants along wire leads placed in cornfields. He found that best success was usually in windy weather with as many drivers as possible. Ligon (1946) states that, while pheasants can sometimes be driven, they have a tendency to fight the leads rather than following them. He also states that juvenile birds drive more readily than do adults.

MISCELLANEOUS METHODS

Immobilizing drugs.--Peterle (1956) states that drugs have been used for capturing pheasants, but offers no further information.

Cannon-net trap (see sharp-tailed grouse).--The cannon-net trap has been used in South Dakota (U.S. Fish and Wildlife Service, 1955), with best results obtained in stormy weather. It was found that some birds, especially cocks, could outrun the net. This was compensated for by increasing the projectile charge, causing the net to be cast more rapidly. It was difficult to get a worthwhile number of birds in the net at once, and the trap is believed selective for females.

Spotlighting.--Spotlighting and handnetting is by far the most successful and most frequently used method of capturing pheasants. It was

first used in the 1920s' in South Dakota (California Department of Fish and Game, 1959). A more representative population can be obtained than with a bait trap, as the latter is usually selective for hens and juveniles (Hart, 1955). Leopold (1933) still feels, however, that cocks have a greater tendency to flush before the spotlight than do hens and are still not quite as "catchable".

Standard procedure in California (California Department of Fish and Game, 1959) is to drive trucks through fields where pheasants are roosting, locate and blind the birds with spotlights, then capture them with long-handled nets. The most efficient crew consists of a driver, two spotlighters, and two netters. The operation can be done with fewer men if necessary (see sage grouse). Best results have been obtained on still nights during the dark of the moon. The birds have a tendency to flush on moonlit nights, and often move to heavy cover during windy weather.

As it is possible to be more selective of the birds caught in this operation than in most others, spotlighting has been used extensively in trapping and marking studies where a good cross section of a population is desired (Mallette and Bechtel, 1959; Hart 1955). For more detailed coverage, see Labisky (1959), Hart (undated), and Smith (1954).

Clap net.--Christensen (1962) suggests his clap net as a possibility for trapping pheasants (see sage grouse).

REFERENCES

- Allen, D. L. (editor)
1956. Pheasants in North America. Stackpole Co., Harrisburg, Pa. 490 p.
- Buss, I. O.
1946. Wisconsin pheasant populations. Wisconsin Conservation Department, Publication 326. 148 p.
- California Department of Fish and Game.
1959. Pheasant management handbook. 42 p.
- Christensen, G. C.
1962. Use of the clap net for capturing Indian sand grouse. *Journal of Wildlife Management* 26(4):399-402.
- Hammerstrom, F. N., Jr., and M. Truax.
1938. Traps for pinnated and sharp-tailed grouse. *Bird-Banding* 9(4):177-183.
- Hart, C. M. Undated. Methods and equipment used to live trap pheasants in California by the spotlighting system. California Department of Fish and Game. 6 p.
- 1955. Pheasant survival studies in California. Western Association of State Game and Fish Commissioners, Proceedings. 35:246-256.
- Hicks, L. E., and D. L. Leedy.
1939. Techniques of pheasant trapping and population control. North American Wildlife Conference, Transactions 4:449-461.
- Kutz, H. L.
1945. An improved game bird trap. *Journal of Wildlife Management* 9(1):35-38.
- Labisky, R. F.
1959. Nightlighting: a technique for capturing birds and mammals. Illinois Natural History Survey, Biological Notes, No. 40. 11 p.
- Leopold, A.
1933. Game management. Charles Scribner's Sons, New York. 481 p.
- O. S. Lee, and H. G. Anderson.
1938. Wisconsin pheasant movement study, 1936-37. *Journal of Wildlife Management* 2(1):3-12.
- T. M. Sperry, W. S. Feeney, and J. A. Catenhusen.
1943. Population turnover on a Wisconsin pheasant refuge. *Journal of Wildlife Management* 7(4):383-394.
- Ligon, J. S.
1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.
- Mallette, R. D., and J. C. Bechtel.
1959. Movement of the ring-necked pheasant in the Sutter Basin of California. *California Fish and Game* 45(3):189-202.
- Peterle, T. J.
1956. Trapping techniques and banding returns for Michigan sharp-tailed grouse. *Journal Wildlife Management* 20(1):50-55.
- Smith, E. H.
1954. Spotlighting for better pheasant management. *South Dakota Conservation Digest* 21(4):2-4.

Thompson, W. K.

1946. Live-trapping and transplanting ring-necked pheasants and sage grouse. Western Association State Game and Fish Commissioners, Proceedings 26:133-137.

U.S. Fish and Wildlife Service.

1955. Improvements to the cannon net trap. Branch of Wildlife Refuges, Wildlife Management Series, No. 12. 26 p.

CHUKAR

Alectoris graeca

Bait trapping has so far been the prevalent method of trapping chukar. Christensen (1954) reports the use of funnel quail traps and modified pheasant traps, such as used by Hicks and Leedy (1939). Harper et al. (1958) used quail traps, modified cloverleaves, and circular traps. They found the latter to be most successful, least expensive, and easiest to construct. It is a two-entrance funnel trap constructed of 1- by 2-inch welded wire and shaped in a circle 33 feet in circumference and 3 feet high. The wire circle is topped with fish netting.

Nevada has been using wheat as bait, but it is good only when natural food is scarce (Christensen 1954). The following "baits" have been used in California (Harper et al., 1958): (1) usual water source surrounded by a trap; (2) usual water source closed off and a container of water inside the trap; (3) both water and grain provided as bait; and (4) baited grain traps used near waterholes but with the water serving only as an attraction to the area.

Nevada has been considering the cannon-net trap as a waterhole trap (Christensen, 1954). Christensen (1962) also suggests his sand grouse clap net as a chukar trap (see sage grouse).

REFERENCES

Christensen, G. C.

1954. The chukar partridge in Nevada. Nevada Fish and Game Commission, Biological Bulletin 1. 77 p.

1962. Use of the clap net for capturing Indian sand grouse. Journal of Wildlife Management 26(4): 399-402.

Harper, H. T., B. H. Harry, and W. D. Baily.

1958. The chukar partridge in California. California Fish and Game 44(1):5-50.

Hicks, L. E., and D. L. Leedy.

1939. Techniques of pheasant trapping and population control. North American Wildlife Conference, Transactions 4:449-461.

GRAY PARTRIDGE

Perdix perdix

Bait trapping during the winter appears to be the most satisfactory way to capture the elusive "hun" (Ligon, 1946; Grange, in Leopold, 1933). E.S. Dziedzic of the Washington Department of Game states (personal communication) that hun trapping in his State has proved quite fruitless unless the weather is severe and about a foot of snow is present. Under these conditions, he recommends the following procedure.

1. A feeding site is swept clean of snow and baited for a week or 10 days before trapping begins. Good baits are grain chaff, straw, alfalfa leaves, and cracked grains of the type grown commonly in the trapping area. The trap may be set up during this time, but both ends should be left open so the birds can travel in and out at will.

2. The trap is constructed entirely of 1 1/2-inch poultry netting and should be approximately 2 feet high and 6 feet long, with a funnel in each end. Recommended funnel size is 18 inches wide, tapering to 6 inches at its end. The trap, left bottomless, is staked to the ground with steel rods and is camouflaged with plant materials.

A. S. Hawkins reports (personal communication) using two types of funnel traps for Wisconsin huns. The small trap was about 3

by 5 feet and 18 inches high. The sides were made of 1-inch wire mesh, the top was of fish netting, and there was a funnel in each end. This trap was portable and occasionally caught entire coveys. Shelled corn was used for bait. Snow sometimes drifted over the corn, and then the trap was ineffective.

Hawkins' larger trap was a chicken-wire cloverleaf approximately 6 by 12 by 4 feet. Ear corn was spiked to the trap framework and was always visible above the snow. This type of trap can be used successfully as part of a winter feeding station.

Hawkins also tried tip-top and bob entrance traps, but these were unsuccessful.

Dr. S. W. Harris (personal communication) reports some luck capturing huns by spot-lighting when the birds are roosted on the ground.

REFERENCES

- Leopold, A.
1933. Game management. Charles Scribner's Sons, New York, 481 p.
- Ligon, J. S.
1946. Upland game bird restoration through trapping and transplanting. New Mexico Game and Fish Commission, Santa Fe. 77 p.

Family MELEAGRIDIDAE

WILD TURKEY

Meleagris gallopavo

BAIT TRAPS

Both automatic and manual traps have been used with bait for capturing turkeys. Sylvester and Lane (1946) prefer the manual traps. They list the following disadvantages of automatic traps: (a) automatic traps must be checked regularly, usually several times a day; (b) turkeys left very long in a trap will panic and injure themselves; (c) predators may find a trap full of turkeys before the trapper returns; and (d) usually only a few birds are caught at one time.

Automatic traps

Automatic traps are either confusion-entrance types or traps with automatic triggering devices.

Funnel trap.--The design used by Sylvester and Lane (1946) and by Baldwin (1947) is at least 12 feet square and has one wire funnel leading into it. The funnel is 12 inches wide and 22 inches high at its innermost point. When funnels were placed in both ends of the trap, turkeys could not be captured.

The turkey follows a trail of grain through the funnel, finds himself trapped, and panics. In his efforts to escape he runs around the enclosure looking for an exit. He hits the funnel (which is unsupported) and causes it to collapse, thereby sealing the trap.

Pole trap.--Early American hunters usually caught turkeys in a box trap made of wooden poles (Mosby and Handley, 1943). Later workers (Baldwin, 1947; Sylvester and Lane, 1946; Wheeler 1948; MacDonald, 1963) used the same basic idea but added many of their own innovations.

One of the most widely used is the trench trap, in which the essential feature is a sloping trench ending in the middle of an enclosure (Sylvester and Lane, 1946; Baldwin, 1947; Wheeler, 1948). The turkeys follow a trail of bait into this trench and up into the pole trap. When trying to escape, the birds will generally run around the edges of the trap and will not venture into the center where the opening is located. Sylvester and Lane (1946) suggest a trench 2 feet wide and 10 feet long. Wheeler's (1948) original trenches extended about 4 feet inside the trap, but he later modified them so that they extended only 22 inches inside. This shorter entrance was far less confining than previous ones, and the turkeys entered more readily.

In one of their pole-type traps, Sylvester and Lane (1946) substituted netting for poles. This resulted in a trap that was not as dark and suspicious-looking as the wooden pole models.

Automatic drop-door trap.--The New Mexico Department of Game and Fish has successfully used a drop-door trap with an automatic triggering device (MacDonald, 1963, and personal communication). The trap was 5 feet square and 2 feet 9 inches high and was covered with weathered slab material obtained from sawmill sites. This material was inexpensive and gave a "rustic" look to the setup. The triggering mechanism was a modified No. 3 steel trap, with one jaw removed so that the turkey's leg would not be caught when the trap snapped "shut."

When a turkey steps of this trigger, the trap door is released.

Manual traps

Drop-door trap (Sylvester and Lane, 1946; Baldwin, 1947; Crump, 1950).--Figure 14 shows details of this trap. It consists of an open-ended box with doors that can be closed when turkeys enter. The trap should be 10 to 16 feet wide, 6 feet high, and 2 to 6 feet longer than wide. Traps smaller than this were seldom used.

Rush traps.--Sylvester and Lane (1946) and Baldwin 1947) both used an open-sided bait trap to capture turkeys. When the birds entered to feed, the operators rushed to the trap and cornered the birds inside. Turkeys

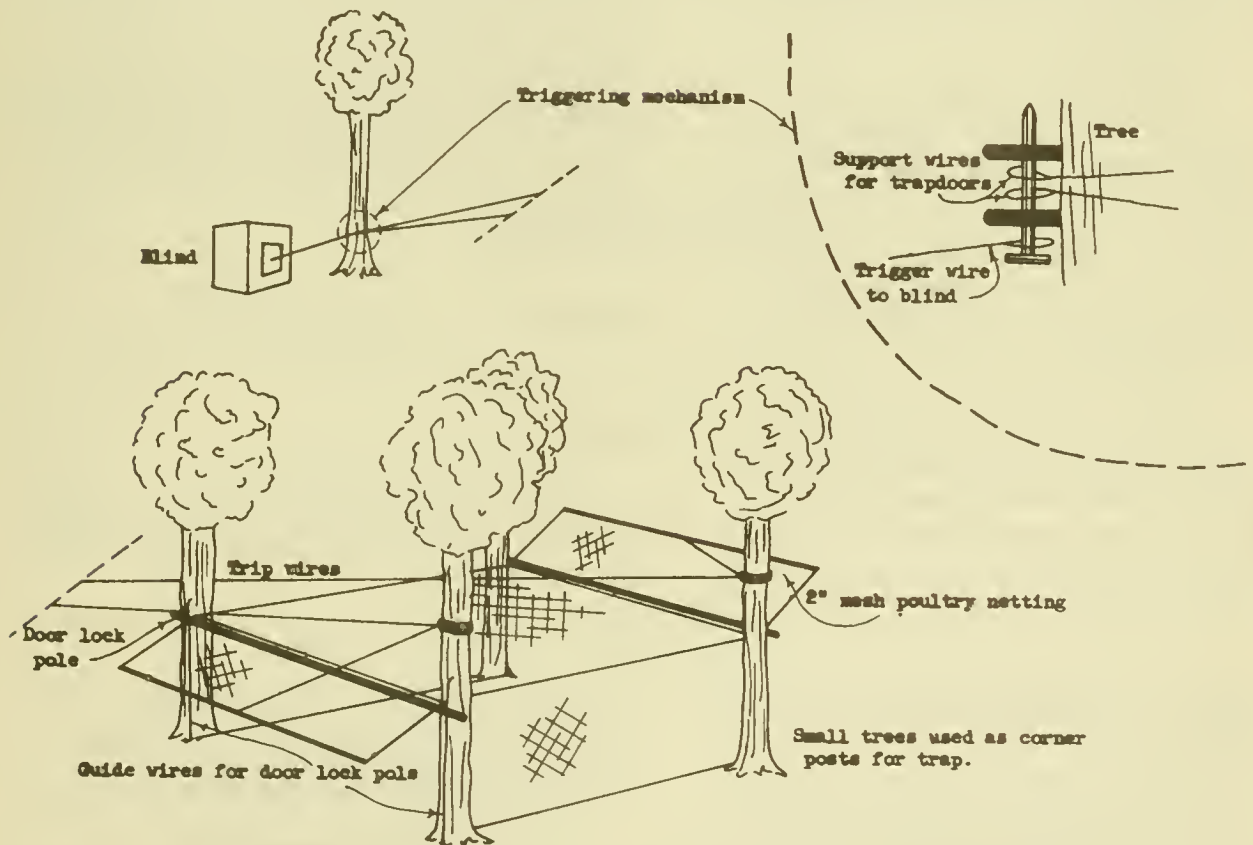


Figure 14.--Drop-door turkey trap (after Sylvester and Lane, 1946).

were captured by this method, but it is not recommended. Some birds were injured trying to escape (Sylvester and Lane, 1946), and most retained a long-lasting trap wariness (Baldwin, 1947).

Drop trap.--Baldwin (1947) found this to be the most successful turkey trap. Other workers (Glazener, 1946; Sylvester and Lane, 1946; Glazener et al., 1964) have also used it successfully.

Netting is used for the drop trap, as it is lighter than wire and will not injure the birds. It is also less conspicuous than wire when the trap is in place (Sylvester and Lane, 1946). The trap is suspended from poles or trees above a baited spot. When turkeys congregate under the trap, an operator in a nearby blind releases it, and it quickly drops over the feeding birds.

The height at which the net is suspended seems to be very important (Glazener et al., 1964). Where the vegetative canopy was low, turkeys could be taken with a net set as low as 5 feet above ground; however, an 8-foot setting proved most successful in areas where turkeys were accustomed to greater overhead clearance.

Glazener et al. (1964) report capturing as many as 150 birds at one time, but this large a catch is usually undesirable because the turkeys are subjected to much stress and possible injury. Losses usually increase with larger trap loads.

Cannon-net trap (see sharp-tailed grouse).--This trap has been used successfully in South Carolina and South Dakota (U.S. Fish and Wildlife Service, 1955), and by the New Mexico Department of Game and Fish (D. MacDonald, personal communication). The trap usually has to be well camouflaged before hens will approach it.

Clap net (see sage grouse).--Christensen (1962) feels his trap may prove adaptable for turkey trapping.

Turkey traps seem to be most effective when set at the edges of clearings or in woods near a road (Wheeler, 1948; Glazener et al., 1964). The best bait in the Southern States appears to be wheat (Sylvester and Lane, 1946; Baldwin, 1947). However, Wheeler (1948) found shelled corn to be the best in his Alabama studies. It lasted well in wet weather and was conspicuous in the trap. Corn was also preferred in Wyoming (Crump, 1950). Glazener et al. (1964) list white and yellow corn and grain sorghum as commonly used baits in Texas. They also had luck in some localities with oats, barley, wheat, and cottonseed cake.

The best trapping is when turkeys are flocking together. Sylvester and Lane (1946) did best from mid-September through mid-December, while Wheeler (1948) recommended mid-August to March. Sylvester and Lane (1946) found poults easier to bait than adults, while gobblers were much easier to catch than were hens. Wheeler (1948), on the other hand, had about equal success with adults and poults, but caught many more hens than gobblers.

ACCIDENTAL TRAPS

None reported.

DRIVE TRAPS

Ligon (1946) states that because of turkeys' habits and psychological makeup it is virtually impossible to drive them.

MISCELLANEOUS METHODS

Mosby and Cantner (1956) have used an immobilizing drug (Avertin) which is administered as a liquid coating on grain. They recommend the following procedure:

a. Prebait an area and determine the number of birds using the bait.

b. Use about twice the amount of grain prebaited, and coat it with undiluted drug. Allow about 0.06 to 0.09 grams per pound of bird.

c. Allow 5 to 10 minutes for the drug to take effect, approach the birds quietly, and place each one in a separate crate.

d. Irrigate the crops to remove excess drug.

REFERENCES

- Baldwin, W. P.
1947. Trapping wild turkeys in South Carolina. *Journal of Wildlife Management* 11(1):24-36.
- Christensen, G. C.
1962. Use of the clap net for capturing Indian sand grouse. *Journal of Wildlife Management* 26(4): 399-402.
- Crump, W. I.
1950. Turkeys on the move. *Wyoming Wildlife* 14(10):10-13.
- Glazener, W. C.
1946. Techniques for restoring the wild turkey. *Western Association of State Game and Fish Commissioners, Proceedings* 26:131-132.
- A. S. Jackson, and M. L. Cox.
1964. The Texas drop-net turkey trap. *Journal of Wildlife Management* 28(2):280-287.
- Ligon, J. S.
1946. Upland game bird restoration through trapping and transplanting. *New Mexico Game and Fish Commission, Santa Fe*. 77 p.
- MacDonald, D.
1963. Trapping and marking Merriam's wild turkeys. *Western Association State Game and Fish Commissioners, 43d Annual Conference, Proceedings*.
- Mosby, H. S., and C. O. Handley.
1943. The wild turkey in Virginia: its status, life history and management. *Virginia Game and Inland Fish Commission, Richmond*. 281 p.
- and D. E. Cantner.
1956. The use of avertin in capturing wild turkeys and as an oral-basal anaesthetic for other wild animals. *Southwest Veterinarian* 9(2):132-136.
- Sylvester, W. R., and P. W. Lane.
1946. Trapping wild turkeys on the Kentucky Woodlands Refuge. *Journal of Wildlife Management* 10(4):333-342.
- U.S. Fish and Wildlife Service.
1955. Improvements to the cannon net trap. *Branch of Wildlife Refuges, Wildlife Management Series, No. 12*. 26 p.
- Wheeler, R. J., Jr.
1948. The wild turkey in Alabama. *Alabama Department of Conservation*. 99 p.

Family RALLIDAE

CLAPPER RAIL Rallus longirostris

BAIT TRAPS

Oney (1954) tried a funnel entrance trap baited with corn and fish, but fluctuations in tide level washed the bait away and the traps were unused.

ACCIDENTAL TRAPS

Stewart (1951) and Adams and Quay (1958) used unbaited funnel traps with wire leads crossing the rail feeding grounds. Best success was obtained just as the period of maximum high tides was approaching and the birds were most active. Stewart (1951) found the best trap site to be about 15 feet from the edge of a tidal creek, with one funnel facing the creek and another facing away. During the first part of August he averaged five rails per day, while in late August the average dropped to two per day.

DRIVE TRAPS

Oney (1954) caught only one bird when drive-trapping, but he felt this was due the sparse rail population in his area. It could be a useful method if rails were plentiful.

MISCELLANEOUS METHODS

Stewart (1951), Oney (1954), and Adams and Quay (1958) all caught rails with nets or by hand during periods of extremely high tides. The major fault of this method is that there are too few extremely high tides.

Stewart (1951) used a drop-net nest trap for capturing female rails. It is a time-consuming method and not adaptable to capturing a large number of birds, but is feasible.

Low (1957) mentions that rails have been caught in mist nets, but this is probably a reference to some of the smaller species.

REFERENCES

- Adams, D. A., and T. L. Quay.
1958. Ecology of the clapper rail in southeastern North Carolina. *Journal of Wildlife Management* 22(2):149-156.
- Low, S. H.
1957. Banding with mist nets. *Bird-Banding* 28(3): 115-128.
- Oney, J.
1954. Final report: Clapper rail survey and investigation study. Georgia Game and Fish Commission, Federal Aid Project W-9-R. 50 p.
- Stewart, R. E.
1951. Clapper rail populations of the middle Atlantic states. North American Wildlife Conference, Transactions 16:421-430.

VIRGINIA RAIL **Rallus limicola** **and** **SORA RAIL** **Porzana carolina**

BAIT TRAPS

None reported.

ACCIDENTAL TRAPS

Pospichal and Marshall (1954) used lead traps with funnels (fig. 1) to capture rails during the summer months. This method yielded almost all juvenile birds (21 out of 25 rails caught).

DRIVE TRAPS

Pospichal and Marshall (1954) found driving to be their most satisfactory technique. Dur-

ing a 2-year study, 78 out of 103 rails were taken as a result of drive trapping. Driving seems to be highly selective of adult birds, with no juveniles being taken during any drive. The traps used were funnel entrance types with an added bob entrance guard. The best trap had a single funnel with a counter-balanced sheet-metal door in the floor just inside the funnel. This trap door completely eliminated escapes.

MISCELLANEOUS METHODS

Labisky (1959) states that both soras and Virginia rails are highly susceptible to capture with nets after being spotlighted. Cummings and Hewitt (1964) also captured several soras with spotlighting equipment.

Low (1957) mentions capturing rails with mist nets but offers no further information.

REFERENCES

- Cummings, G. E., and O. H. Hewitt.
1964. Capturing waterfowl and marsh birds at night with light and sound. *Journal of Wildlife Management* 28(1):120-126.
- Labisky, R. F.
1959. Nightlighting: a technique for capturing birds and mammals. Illinois Natural History Survey, Biological Notes, No. 40. 11 p.
- Low, S. H.
1957. Banding with mist nets. *Bird-Banding* 28(3): 115-128.
- Pospichal, L. B., and W. H. Marshall.
1954. A field study of sora rail and Virginia rail in central Minnesota. *Flicker* 26:2-32.

Family SCOLOPACIDAE

WOODCOCK **Philohela minor**

BAIT TRAPS

None reported.

ACCIDENTAL TRAPS

Cloverleaf traps (fig. 5) have been used during the summer and fall (Liscinsky and

Bailey, 1955; Sheldon, 1955; Blankenship, 1957). Liscinsky and Bailey (1955) obtained best results when traps were placed in moist depressions or gullies shaded by low trees and shrubs. This is the type area in which woodcocks congregate to feed during the heat of the day. Their trap was 1 foot high and 18 feet in circumference, but they suggest a larger trap if the area has a substantial population.

Another type of accidental trap that has received much use is the mist net, used to capture woodcock on the singing grounds during the breeding season (Sheldon, 1955, 1960; Blankenship, 1957; Martin and Clark, 1964). The mist net is a large, fine, silk or nylon net erected on poles in such a way that a bird striking either side will be engulfed by the loose netting. It has long been used in Asia and the Mediterranean regions to obtain birds for market (Mosby, 1963).

Sheldon (1960) used a high-quality 1 1/4-inch mesh net which he placed in the center of the singing ground. He joined several nets together to form a single large net 20 feet high. The nets were arranged on aluminum poles in such a way that they could be raised and lowered with pulleys.

Martin and Clark (1964) found mist nets to be the most dependable means of capturing large numbers of woodcocks, but they often had to set 20 or more nets to effectively intercept birds entering the trapping area.

A third type of accidental trap is the "blind" butterfly trap (see below). The bird accidentally walks onto, or lands on, the hidden trap and is caught.

DRIVE TRAPS

None reported.

MISCELLANEOUS METHODS

Butterfly trap.--The type of "bait" most frequently used to capture woodcock is a decoy set on the "butterfly trap" (Norris et al., 1940; Studholme and Norris, 1942; Sheldon, 1955). A dummy woodcock is set on a steel trap and surrounded by a closing net (fig. 15). Norris et al. (1940) used a No. 3 steel trap, but Norris and Studholme (1942) report that a No. 4 trap has faster action. This trap is used to capture singing males on the breeding ground, and the procedure is as follows: the trap is set at the spot where a male woodcock usually sings; the bird sees the dummy and attempts to copulate with it; the trap operator pulls a cord which releases the trap and closes the net over bird and decoy.

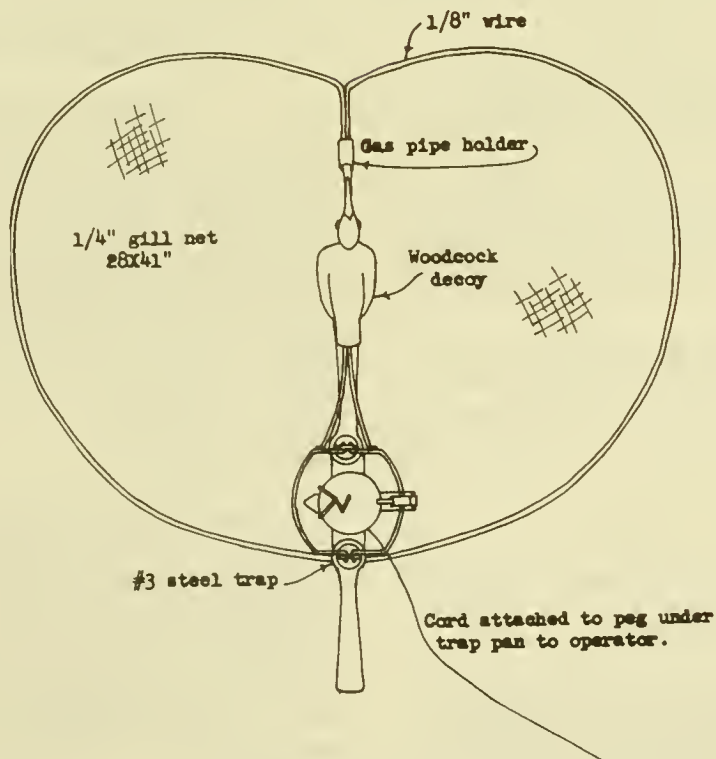


Figure 15.--Woodcock butterfly trap (after Norris et al., 1940).

Sheldon (1955) developed an automatic butterfly-trap with which the bird catches himself. This automatic trap has also been used as a blind set without a decoy, in this way serving also as a trap for female woodcock.

Some experiment has been done in the use of sound recordings to lure woodcocks to traps (Sheldon, 1955).

Spotlighting.--Spotlighting has proved successful on the southern wintering areas (Glasgow, 1953) and some use has been made of the technique on the breeding grounds (Blankenship, 1957; Martin and Clark, 1964). It appears to be less useful in the breeding season owing to the excitability of the birds at that time (Norris et al., 1940; Blankenship, 1957).

Glasgow (1953) tried sealed-beam lanterns and carbide lamps, and also was successful with a 6 volt headlamp. Martin and Clark (1964) preferred the last instrument because it left their hands free to net the blinded woodcocks. They captured the birds with dip nets mounted on a 10-foot pole.

Both Glasgow (1953) and Martin and Clark (1964) achieved best results on very dark nights. This was because woodcocks tended to flush readily on moonlit nights. Glasgow (1953) had poor results during dry periods, presumably because woodcocks go elsewhere when earthworms are not readily available.

Hand netting.--Mendall (1938) and Blankenship (1957) both used dogs to locate woodcock broods, then captured the young in handnets;

REFERENCES

- Blankenship, L. H.
1957. Investigations of the American woodcock in Michigan. Michigan Department of Conservation Game Division Report 2123. 217 p.
- Glasgow, L. L.
1953. The American woodcock (*Philohela minor*) in Louisiana. Presented at 7th Annual Conference, Southeastern Association of Game and Fish Commissioners, Chattanooga, Tenn. 16 p.
- Liscinsky, S. A., and W. J. Bailey Jr.
1955. A modified shorebird trap for capturing woodcock and grouse. *Journal of Wildlife Management* 19(3):405-408.
- Martin, F. W., and E. R. Clark.
1964. Summer banding of woodcock, 1962-1963. U.S. Bureau of Sport Fisheries and Wildlife, Migratory Bird Populations Station, Laurel, Md. Administrative Report 43. 9 p.
- Mendall, H. L.
1938. A technique for banding woodcock. *Bird-Banding* 9(3):153-155.
- Mosby, H. S. (editor).
1963. Wildlife investigational techniques, 2d edition. Wildlife Society, Ann Arbor, Mich. 300 p.
- Norris, R. T., J. D. Beule, and A. T. Studholme.
1940. Banding woodcocks on Pennsylvania singing grounds. *Journal of Wildlife Management* 4(1):8-14.
- Sheldon, W. G.
1955. Methods of trapping woodcocks on their breeding grounds. *Journal of Wildlife Management* 19(1):109-155.
- 1960. A method of mist netting woodcocks in summer. *Bird-Banding* 31(3):130-135.
- Studholme, A. T., and R. T. Norris.
1942. Breeding woodcock populations. *Auk* 59: 229-233.

COMMON SNIPE

Capella gallinago

The mist net is the trap most commonly used for capturing snipe. Robbins (1953) and Aldrich (1957) both mention mistnetting on the southeastern wintering grounds, Aldrich having used tape recordings of territorial calls to lure the birds to the net. Tuck (1957) used mist nets in two ways, one to flush birds from their nests into the net, and the other to lure them into the nets with recordings of territorial calls.

Murphy (1955) gives a description of spotlighting and netting shorebirds in the Philippines, and this method is suggested as a technique to capture snipe. Also used for shorebirds is a hand-operated thrownet which is tossed over congregated birds (McClure 1956). This throw net, or possibly the cannon-net trap, could be used where many snipe are together.

Ronald Somerville and Cliff Judkins (personal communication) has some luck in northwestern California with an accidental-type lead trap (figure 1).

REFERENCES

Aldrich, J. W.

1957. Perspective of woodcock, snipe and rail investigations - 1956, in Investigations of woodcock, snipe, and rails in 1956. U.S. Fish and Wildlife Service, Special Scientific Report--Wildlife No. 34, p. 1-7.

McClure, H. E.

1956. Methods of bird netting in Japan applicable to wildlife management problems. Bird-Banding 27(2):67-73.

Murphy, R. C.

1955. Bird-netting as a technique for banding shore-birds. Bird-Banding 26(4):159-161.

Robbins, C. S.

1954. Wilson's snipe wintering ground studies, 1951-52, in Investigations of woodcock, snipe, and rails in 1953. U.S. Bureau of Sport Fisheries and Wildlife, Special Scientific Report--Wildlife No. 24:51-56.

Tuck, L. M.

1957. On the breeding of the Wilson's snipe in Newfoundland, in Investigations of woodcock, snipe, and rails in 1956. U.S. Bureau of Sport Fisheries and Wildlife, Special Scientific Report--Wildlife No. 34.

Family COLUMBIDAE

BAND-TAILED PIGEON

Columba fasciata

All methods described below rely upon the pigeons' taking bait at the trap. Success is likely to vary greatly, because bandtails have a tendency to feed on only one item at a time and will ignore any other food placed for them (California Department of Fish and Game, undated).

Funnel bait trap.--Neff and Culbreath (1947) used a funnel trap 10 by 6 by 2 feet. This trap was effective for small numbers of birds, but they found that the first pigeon to enter would sit in the funnel's mouth until all grain within reach had been eaten. This often blocked the funnel for long periods, and the operation was slowed considerably.

Ladder-top trap.--Also used by Neff and Culbreath (1947), the top of this trap was constructed of bars placed 4 inches apart. The pigeons could easily drop between these bars to obtain the bait inside but, presumably, an exit would be harder. It was soon learned, however, that the pigeons could escape from this trap by taking a short hop, flapping once, and then closing their wings again to pass through the bars. These workers felt that a very tall trap of this same type would alleviate this escape problem.

Drop trap.--Wooten (1955) used a 16-foot-square, net-covered frame which was supported at one end with a 7-foot pole. A wire was attached to the upper edge of the trap, and this was operated from a nearby blind. A pull of the wire caused support to disengage and the net fell over the birds.

Wooten dyed his net green or brown to match the surroundings; D. B. Houston (personal communication) used a white net and natural wood frame with very good results.

Drop-door trap.--A setup similar to the drop-door turkey trap (fig. 14) has been used by Neff and Culbreath (1947). As many as 60 birds have been trapped at one time.

Cannon-net trap.--This trap has been used in California (U.S. Fish and Wildlife Service, 1955; California Department of Fish and Game, undated) and is considered the most successful pigeon trap by the Washington Department of Game (E.S. Dziedzic, personal communication). The best time for trapping is during spring migration.

Most of the Colorado pigeon trapping (Neff and Culbreath, 1947) has incorporated as bait whatever grains were being grown in the vicinity (J. A. Neff, personal communication). Yellow corn, barley, wheat, and oats were all commonly used.

REFERENCES

- California Department of Fish and Game.
Undated. Band-tailed pigeons. 2 p.
- Neff, J. A., and J. C. Culbreath.
1947. Band-tailed pigeon natural history and its value for a management plan. Western Association of State Game and Fish Commissioner, Proceedings 27:154-164.
- U.S. Fish and Wildlife Service.
1955. Improvements to the cannon net trap. Branch of Wildlife Refuges, Wildlife Management Series, No. 12. 26 p.
- Wooten, W. A.
1955. A trapping technique for band-tailed pigeons. Journal of Wildlife Management 19(3):411-412.

WHITE-WINGED DOVE

Zenaida asiatica

BAIT TRAPS

Stair (1956) used Stoddard quail traps (see bobwhite) baited with waste grain and weed seeds. Both funnel and bob-wire entrances were effective. Texas workers used funnel-entrance traps baited with whole yellow corn (W. H. Kiel, Jr., personal communication).

Stair (1956) also used a drop-door trap built over a windmill watering trough.

ACCIDENTAL TRAPS

None reported.

DRIVE TRAPS

Stair (1956) effectively combined drive-trapping techniques with the cannon-net trap. An open field was located where whitewings were feeding. At least 5 drivers walked abreast slowly and evenly down the field. The birds would take flight as the men approached, but would normally alight a few hundred feet ahead and continue feeding. The procedure continued until the birds were within range of the cannon net. The cannons were then detonated and the net was hurled over the birds.

MISCELLANEOUS METHODS

Breeding adults have been captured with Swank-type nest traps (W.H. Kiel, Jr., personal communication).

REFERENCE

- Stair, J.
1956. Dove investigations. Arizona Game and Fish Department, Federal Aid Project W-53-R-6. 11 p.

MOURNING DOVE

Zenaidura macroura

BAIT TRAPS

A 2-celled modification of the clover-leaf trap (fig 5) has been used by Keeler and Winston (1951). Stoddard quail traps have been used by several workers (Thompson, 1951; Keeler, 1953; Winston, 1954; Stair, 1956) and have been found to be one of the most effective traps.

Several trigger traps have been used. One is the resetting type used by Keeler and Winston (1951). The bird enters the trap in search of food, steps on a trap door in the floor, and drops into a receiving pen below. The door is counterbalanced so that it returns to the "set" position.

Another bait trap used widely (Keeler and Winston, 1951; Thompson, 1951; Keeler, 1953; Winston, 1954) is the Potter trap. This trap has a drop door which the bird releases by stepping on a treadle on the floor of the trap. Because only one bird can normally be caught at one time, this trap is useful only for small-scale programs. Keeler (1953) found that wind, rain, hail, and small birds set this trap off very easily.

Stair (1951) used a drop-door trap over a windmill trough. The cannon-net trap was used by Thompson (1951).

Large, semipermanent house traps have been used by Austin (1951) and Winston (1954). These funnel-entrance traps are usually about 6 feet high and are only practical for long-term projects in which portability and cost are not of major concern.

ACCIDENTAL TRAPS

None reported.

DRIVE TRAPS

Harris and Morse (1958) used mist nets to capture nesting doves. Their procedure re-

quired three men. A nest was located and the route determined by which the adult dove usually approached the nest. Two men holding a mist net approached the nest from this side, while a third "panic man" circled in from the back and scared the bird into the net.

MISCELLANEOUS METHODS

Mirror trap.--Grizzell (1952) caught one dove in this type trap (see ruffed grouse) but it was probably an accident.

Nest traps.--Two nest traps have been devised, a manual one (Swank, 1952) and an

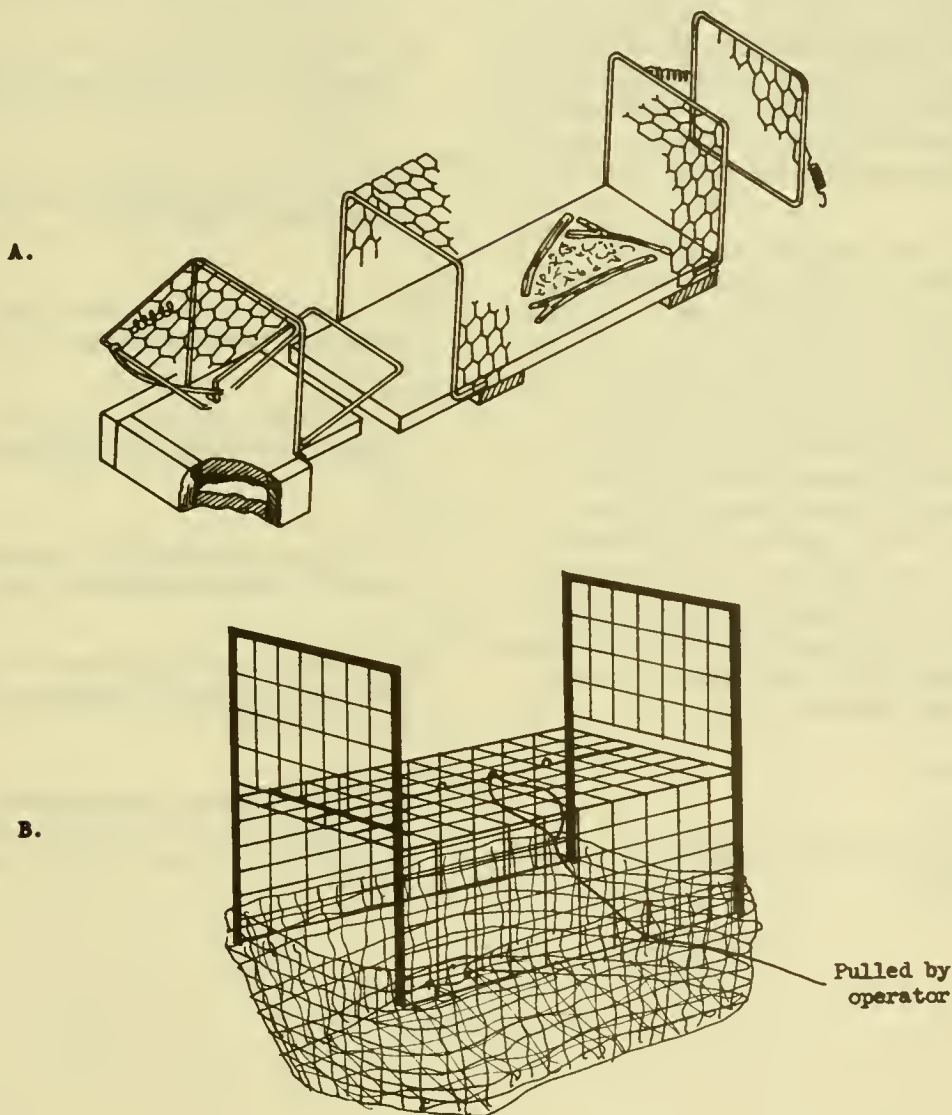


Figure 16. --Dove nest traps: a, Stewart's (1954) automatic trap with nesting base; b, Swank's (1952) manual trap. Stewart trap has treadle door arrangement which dove releases when entering nest; Swank trap is built around active nest and is triggered by operator when bird returns.

automatic one (Stewart, 1954). Both traps work on the drop-door principle, that is, the bird enters the open trap and the doors close behind it. The Stewart trap is a combination nest base and trap. If the doves use the base for their nest, the trap doors are added to it. Figure 16 shows the two types.

Nestling banding.--Pigeons and doves differ from other North American upland game birds in that their young are altricial and stay in the nest for some time after hatching. This makes it feasible to band nestlings before they reach flying stage. Dove nests are often easily accessible in trees and it is just a matter of climbing or reaching into the nest and picking out the young to band. Kossack (1955) describes a "Snooper," a mirror on a long pole, that facilitates looking into high nests without disturbing the young.

Kossack (1955) used No. 3A bands for nestling doves. He affixed them with elastic adhesive tape to the legs of birds 3 to 8 days old. Kazynski and Kiel (1963) made studies that indicated some relation between the use of adhesive tape and predator loss. They therefore recommended that the adhesive not be used and that banders should wait until nestlings were at least 6 days old before banding them. They used size No. 3 bands for doves 6 or 7 days old, and No. 3A bands for larger birds. While band retention seemed to increase with the age of the bird at banding, the doves could fly too well after 11 days to wait any longer than that.

REFERENCES

- Austin, O. L. Jr.
1951. The mourning dove on Cape Cod. *Bird-Banding* 22(4):149-174.
- Grizzell, R. A. Jr.
1952. Selectivity of mirror traps. *Journal of Wildlife Management* 16(1):114-115.
- Harris, S. W., and M. A. Morse.
1958. The use of mist nets for capturing nesting mourning doves. *Journal of Wildlife Management* 22(3):306-309.
- Kaczynski, C. F., and W. H. Kiel Jr.
1963. Band loss by nestling mourning doves. *Journal of Wildlife Management* 27(2):271-279.
- Keeler, J. E.
1953. The mourning dove story. Alabama Department of Conservation. 66 p.
- and F. A. Winston.
1951. Mourning dove trapping in the southeast: a cooperative dove study. *Bird-Banding* 22(4): 174-179.
- Kossack, C. W.
1955. Mourning dove banding project. *Inland Bird Banding News* 27(1):1-8.
- Stair, J.
1956. Dove investigations. Arizona Game and Fish Department, Federal Aid Project W-53-R-6. 11 p.
- Stewart, P. A.
1954. Combination substratum and automatic trap for nesting mourning doves. *Bird-Banding* 25(1): 6-8.
- Swank, W. G.
1952. Trapping and marking of adult nesting doves. *Journal of Wildlife Management* 16(1):87-90.
- Thompson, S.
1951. The southeastern cooperative dove study. North American Wildlife Conference, Transactions 16:296-306.
- Winston, F. A.
1954. Status, movement and management of the mourning dove in Florida. Florida Game and Fresh Water Fish Commission, Technical Bulletin 2, 86 p.

INDEX TO TRAPS

- bob entrance traps, 4, 8, 12, 26, 30, 34. Fig. 2, p. 5.
- butterfly traps, 31, 32. Fig. 15, p. 31.
- cannon-net traps, 4, 10, 14, 15, 23, 25, 28, 32, 33, 34. Figs. 8 and 9, p. 13.
- canoe quail trap, 21, 22.
- clap nets, 15, 18, 19, 21, 22, 24, 25, 28. Fig. 10, p. 16.
- cloverleaf traps, 5, 8, 9, 20, 22, 23, 24, 25, 26, 30, 34. Fig. 5, p. 8.
- cock-and-hen traps, 18, 21, 22. Fig. 11, p. 18.
- drop-door traps, 9, 27, 33, 34, 36. Fig. 14, p. 27; fig. 16, p. 35.
- drop nets, 10, 28, 29, 33. Fig. 6, p. 11.
- funnel traps, 4, 7, 8, 10, 14, 15, 17, 19, 20, 21, 22, 23, 25, 26, 29, 30, 33, 34, 35. Fig. 12, p. 20; fig. 13, p. 21.
- government sparrow trap, 17, 20, 22.
- hand, capture by, 29, 36.
- hand nets, 4, 9, 10, 24, 29, 32.
- immobilizing drugs, 10, 23, 28.
- ladder-top trap, 33.
- lead traps, 3, 4, 10, 14, 15, 19, 22, 23, 29, 30, 33. Fig. 1, p. 3.
- mirror traps, 3, 5, 6, 7, 35. Fig. 3, p. 6; fig. 4, p. 7.
- mist nets, 29, 30, 31, 32, 35.
- nooses, 4.
- pole traps, 26.
- Potter trap, 34.
- rush traps, 27.
- spot lighting, 9, 10, 16, 19, 23, 24, 26, 30, 32.
- Stewart trap, 35, 36.
- Stoddard trap, 17, 19, 20, 22, 34.
- Swank trap, 35.
- tip-top traps, 5, 10, 11, 12, 26. Fig. 7, p. 12.
- throw nets, 9, 15, 32.
- trench trap, 26.

The Department of the Interior, created in 1849, is a Department of Conservation, concerned with management, conservation, and development of the Nation's water, wildlife, fish, mineral, forest, and park and recreational resources. It has major responsibilities also for Indian and Territorial affairs.

As America's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States, now and in the future.



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
WASHINGTON, D. C. 20240